Upper Providence Township Municipal Complex Renovations & Addition

935 N Providence Rd
Media, PA 19063
MKSD Project No. 26.136

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PROJECT MANUAL
MKSD Project No. 26.136
Dated: 11.12.2026

UPPER PROVIDENCE TWP
MUNICIPAL COMPLEX RENOVATIONS & ADDITION

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DOCUMENT 00 0115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

G001	COVER SHEET
G002	CODE INFORMATION
G003	LIFE SAFETY PLAN – FIRST FLOOR
G004	LIFE SAFETY PLAN – SECOND FLOOR
S100	FOUNDATION & FRAMING PLAN – SALLYPORT
S101	PARTIAL SECOND FLOOR FRAMING PLAN - FOLDING PARITION
S200	GENERAL NOTES – SCHEDULES
S300	TYPICAL FOUNDATION DETAILS & SECTIONS
S400	TYPICAL FRAMING DETAILS & SECTIONS
AD101	FIRST FLOOR DEMOLITION PLAN
AD102	SECOND FLOOR DEMOLITION PLAN
AD103	THIRD FLOOR DEMOLITION PLAN
A003	PARTITION TYPES
A101	OVERALL FIRST FLOOR PLAN
A101A	ENLARGED FLOOR PLAN - ZONE A
A101B	ENLARGED FLOOR PLAN - ZONE B
A101C	ZONE C – ENLARGED PLANS AND SECTIONS
A102	OVERALL SECOND FLOOR PLAN
A102A	ENLARGED SECOND FLOOR PLAN - ZONE A
A102B	ENLARGED SECOND FLOOR PLAN - ZONE B
A200	BUILDING ELEVATIONS
A350	WALL SECTIONS
A351	WALL SECTION DETAILS
A352	PLAN DETAILS
A401	REFLECTED CEILING PLAN FIRST FLOOR
A402	REFLECTED CEILING PLAN SECOND FLOOR
A500	SCHEDULES AND DETAILS
A601	FINISH LEGEND, SCHEDULE & DETAILS
A701	FIRST FLOOR FINISH PLAN
A702	SECOND FLOOR FINISH PLAN
A712	INTERIOR ELEVATIONS & DETAILS – POLICE
A713	INTERIOR ELEVATIONS & DETAILS - TOWNSHIP
A714	ENLARGED PLAN, ELEVATIONS, & DETAILS - TWP MEETING ROOM
A715	TOILET ROOM PLANS & ELEVATIONS
A716	LOCKER ROOM PLANS & ELEVATIONS
A801	OVERALL FIRST FLOOR FFE PLAN
A802	OVERALL SECOND FLOOR FFE PLAN

M000	MECHANICAL LEGEND, ABBREVIATIONS & SYMBOLS
M100	FIRST FLOOR MECHANICAL DEMOLITION PLAN
M101	SECOND FLOOR MECHANICAL DEMOLITION PLAN
M200	FIRST FLOOR MECHANICAL NEW WORK PLAN
M201	SECOND FLOOR MECHANICAL NEW WORK PLAN
M300	MECHANICAL DETAILS & AUTOMATIC TEMPERATURE CONTROL (ATC) DIAGRAMS
M400	MECHANICAL SCHEDULES
P000	PLUMBING LEGEND, ABBREVIATIONS & SYMBOLS
P100	UNDERSLAB PLUMBING DEMOLITION PLAN
P101	FIRST FLOOR PLUMBING DEMOLITION PLAN
P102	SECOND FLOOR PLUMBING DEMOLITION PLAN
P200	UNDERSLAB PLUMBING NEW WORK PLAN
P201	FIRST FLOOR PLUMBING NEW WORK PLAN
P202	SECOND FLOOR PLUMBING NEW WORK PLAN
P300	PLUMBING SCHEDULES
P400	PLUMBING DETAILS
FP000	FIRE PROTECTION LEGEND, ABBREVIATIONS, SYMBOLS, & DETAILS
FP101	FIRST FLOOR FIRE PROTECTION DEMOLITION PLAN
FP102	SECOND FLOOR FIRE PROTECTION DEMOLITION PLAN
FP201	FIRST FLOOR FIRE PROTECTION NEW WORK PLAN
FP202	SECOND FLOOR FIRE PROTECTION NEW WORK PLAN
E000	ELECTRICAL LEGEND, SYMBOLS, AND ABBREVIATIONS
E001	ELECTRICAL SINGLE-LINE DIAGRAM
E002	ELECTRICAL SINGLE-LINE DIAGRAM - NEW WORK
E010	ELECTRICAL SITE PLAN
E100	FIRST FLOOR ELECTRICAL DEMOLITION PLAN
E101	SECOND FLOOR ELECTRICAL DEMOLITION PLAN
E200	FIRST FLOOR LIGHTING NEW WORK PLAN
E201	SECOND FLOOR LIGHTING NEW WORK PLAN
E300	FIRST FLOOR POWER, TELECOM, FIRE ALARM NEW WORK PLAN
E301	SECOND FLOOR POWER, TELECOM, FIRE ALARM NEW WORK PLAN
E400	ELECTRICAL DETAILS
E500	ELECTRICAL SCHEDULES
E501	ELECTRICAL SCHEDULES

END OF SECTION 00 0115

INVITATION TO BID

Upper Providence Township Municipal Complex Renovations & Addition
935 N Providence Rd,
Media, PA 19063

The Upper Providence Township will receive sealed electronic public bids via the PennBid Program for the Renovations and Addition for the Administration and Police Building until Thursday, **December 17, 2026 at 2:00 pm** prevailing time, via PennBid ONLY, at which time bids will be opened. Results will be displayed publicly on PennBid shortly thereafter. No hard-copy or hand-delivered submissions will be accepted.

Prime Bid Packages:

GENERAL CONSTRUCTION - BP-01 (to include Civil / Site Work)
PLUMBING CONSTRUCTION - BP-02 (to include Fire Protection)
MECHANICAL CONSTRUCTION - BP-03
ELECTRICAL CONSTRUCTION - BP-04 (to include Security, A/V, IT)

Bid documents are available at no cost on PennBid (pennbid.bonfirehub.com)

Addenda, if any, will be issued electronically via PennBid. Questions regarding this solicitation shall be submitted via the "Public Q&A" section within PennBid.

A **NON- MANDATORY** pre-bid conference for **ALL** contracts will be held **IN-PERSON**, on **Tuesday, November 24, 2026, at 11:00 am** at 935 N Providence Rd, Media, Pennsylvania 19063. **Attendance of all Prime Contract Bidders is NOT mandatory, but strongly encouraged.** Prospective bidders are encouraged to obtain the bidding documents well in advance of the non-mandatory pre-bid meeting.

All bids must be accompanied by a certified check or bank draft, payable to Upper Providence Township, or a satisfactory Bid Bond executed by the Bidder and an acceptable surety in the amount equal to ten percent (10%) of the total bid shall be submitted with each bid, along with all required items as indicated in the Bid Documents checklist. Performance and Payment Bonds will be required from the lowest responsible bidders at a later date along with all other required documentation.

The Project Architect is MKSD Architects (1209 Hausman Road, Suite A, Allentown, PA 18104). The Project Construction Manager is New Road Construction Management (95 W Court St, Doylestown, PA 18901).

This project is subject to the provisions of the PA Prevailing Wage Act.

Bid Documents will be viewable to the public via PennBid at 10:00 am., prevailing time, **Thursday, November 12, 2026.**

The award will be made to the lowest responsible and responsive bidder submitting a bid in conformity with the specifications. However, the Township reserves the right to reject any or all bids.

This project is financed by Upper Providence Township.

UPPER PROVIDENCE TOWNSHIP
Barry Luber; Township Manager

END OF 00 1000

SECTION 00 11 00 – INSTRUCTIONS TO BIDDERS

1. General

1.1 The drawings and specifications are complimentary via the PennBid Program. Any labor and/or material not shown on the drawings but called for in the specifications or any labor and/or material not called for in the specifications but shown on the drawings, shall be furnished by the contractor as though shown and called for in both.

2. DEFINED TERMS

Terms used in these Instructions to Bidders, which are defined in the General Conditions of the Contract for Construction (the “General Conditions”), have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to Owner, as distinct from a sub-Bidder, who submits a bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, and the Contract Documents (including all Addenda issued prior to receipt of Bids). The numbering system refers to Articles.

2. COPIES OF BIDDING DOCUMENTS

2.1 In order to Bid the Project, complete sets of PDF documents must be obtained.

2.2 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner, Architect, or Construction Manager assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents. Bidding Documents consist of Contract Documents (and all reference standards), specifications, addenda, and drawings. Bidder is responsible to make sure that the set of Bidding Documents is complete and that any printed contract document is legible and represents properly all the information as represented in the PDF file.

2.3 Owner, Architect, and Construction Manager, in making copies of the Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

3. QUALIFICATIONS OF BIDDERS

3.1 **The following information must be completed and submitted when requested by the Construction Manager.**

3.1.1 The Contractors Qualification Statement A305-2020 found in Section 001153. Use additional pages to complete any of the sections if more space is needed. Bidder’s failure to fully and accurately disclose all information requested in the Request for Qualifications questionnaire shall constitute grounds for Bidder’s disqualification from being considered the lowest responsive, responsible Bidder.

3.2 To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit with their bid proposal, written evidence such as financial data, insurance certificates, previous experience of the Bidder and its assigned personnel, present commitments, and any other information that may be requested by the Owner. Each Bid must contain evidence of Bidder's qualification to do business in the Commonwealth of Pennsylvania, or covenant to obtain such qualification prior to award of the Contract. Owner reserves the right to reject Bidder if he cannot satisfy all of the Qualification Requirements, including those listed in the Technical Specifications.

3.3 In determining the lowest responsible Bidder, the Owner will consider the integrity, efficiency, experience of the Bidder and its assigned personnel, promptness, current workload, financial capability, performance on recent projects, references from owners, architects, and engineers, list of potential sub-contractors, schedule of values, and ability to successfully and timely complete the Project**.** The apparent low Bidder must demonstrate competency and provide any or all of the above information requested within three (3) calendar days of request. Owner reserves the right to reject the Bidder as non-responsive if all the information is not received on time and/or does not reasonably satisfy the Owner's evaluation process.

3.4 In addition to all the requirements specified in Articles 3.1, 3.2 and 3.3 regarding qualifications of Bidders, the Owner will evaluate Bidders using the following additional criteria:

3.4.1 The Bidder and its assigned personnel must have successfully performed a minimum of 3 previous Pennsylvania public municipal projects within the last 5 years of similar type or a contract value of at least seventy-five percent (75%) of the amount of the Bidder's Base Bid. Provide references including telephone number and contact person.

3.4.2 The Bidder shall perform not less than ten percent (10%) of the actual construction Work with staff employed directly by the Bidder. Project Management and Office Staff shall NOT be included in this percentage.

3.4.3 The Bidder, or its assigned personnel, must have successfully performed at least 3 Pennsylvania public municipal projects within the last 5 years where they have managed multiple trades and coordinated and scheduled all the activities for projects as per Article 3.4.1. Provide references including telephone number and contact person.

3.4.4 An Agreement of Surety certifying that the Surety Company is committed to provide the Bidder with a Performance Bond and Payment Bond each in the amount of one hundred percent (100%) of the contract amount. The Surety Company must have an AM Best rating of A- or higher and a financial rating of Class X or higher.

3.4.5 The Bidder's performance on previous projects including claims, litigation, coordination of work, staffing, and timely completion. If it is determined that the Bidder has not fully performed previous projects in a coordinated, timely, and good and workmanlike manner, the Owner reserves the right to reject the Bid.

3.4.6 The Bidder shall also refer to Articles 11 and 16.

3.5 Owner shall be entitled to recover attorneys' fees and costs incurred in defending any unsuccessful challenge brought by a Bidder in its own name or as proxy for a Municipality resident to Owner's award of a contract to another Bidder, from the Bidder who brought the unsuccessful challenge as more fully set forth in Section 13.8.1 of the General Conditions of Contract.

3.6 All Bidders should be aware that the Owner encourages and promotes MBE (Minority Business Enterprise) and WBE (Women's Business Enterprise) participation for this Project. Bidders are encouraged to do their own research on the qualifications, and other factors, in preparing a comprehensive and responsible bid.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

4.1 It is the responsibility of each Bidder, before submitting a Bid, to:

1. Examine the Contract Documents thoroughly.
2. Visit the site to become familiar with local conditions that may affect the cost, progress, performance, or furnishing the Work.
3. Consider federal, state, and local laws and regulations that may affect cost, progress, performance, or furnishing of the Work.
4. Study and carefully correlate Bidder's observations with the Contract Documents.
5. Notify Architect and Construction Manager of any conflicts, errors, or discrepancies discovered in the Contract Documents.

4.1.1 REVIEW OF DRAWINGS AND SPECIFICATIONS

A. Bidders shall thoroughly examine and be familiar with the Specifications and Drawings. The failure or omission of any Bidder to receive or examine any form, instrument, document, or visit the site and acquaint himself with conditions there existing, shall in no way relieve any Bidder from obligation with respect to his or her Bid. By submitting a Bid, the Bidder agrees and warrants that he/she has examined the site and the Specifications and Drawings and, where Specifications and/or Drawings require in any part of the Work a given result to be produced, that the Specifications and Drawings are adequate, and the required result can be produced under the Specifications and Drawings. No claim for any additional costs will be allowed because of alleged impossibilities in the production of the results specified or because of inadequate or improper plans and specifications and whenever a result is required, the successful Bidder shall furnish any and all extras and make any changes needed to produce the required result for the sum stated in the form of proposal.

B. Should any Bidder find discrepancies, duplications, or omissions in the documents or have doubt as to the meaning expressed by the Contract Documents, he/she shall make inquiry at once in writing to the Architect and Construction Manager. Where changes, corrections, or clarifications to Contract Documents are deemed necessary by the Architect and/or Construction Manager, he will issue written Addenda accordingly. Addenda shall be a part of the Contract Documents. No oral, telephone, email, or letter instructions will be considered as

having effect upon the Contract Documents; Addenda only shall constitute change to them. Bidders and sub-Bidders are urged to make early examination of Contract Documents and make inquiries about them, if necessary, even though prices may not be determined until late in the bidding period.

4.2 The site may be made available for visits at the pre-bid conference and at the other specific designated dates and times determined at the pre-bid conference.

4.3 Information and data reflected in the Contract Documents with respect to underground facilities at or contiguous to the site is based upon information and data furnished to Owner and Architect and/or Construction Manager by owners of such underground facilities or others, and Owner and Architect and/or Construction Manager do not assume responsibility for the accuracy or completeness thereof. Successful Bidder shall verify the location of all underground utilities prior to any excavation.

4.4 Successful Bidder for the General Contract is responsible, on behalf of the Owner, for providing the physical markings of all existing utilities including those on site as indicated on the drawings or that may be identified in the field. The locations shown on the drawings are approximate. The Bidder must include in his proposal the cost for hand-dug test holes, or other means, to ascertain the precise position of such underground facilities on the site owned by the Owner. This verification should be performed for any utilities to be relocated, removed, modified, or that may otherwise interfere with planned work. The utilities in the public right of way will be identified and marked by the appropriate facility owner as per the requirements of the PA One Call Act as amended. Physical layout is to be performed in full compliance with the PA One Call PA Act 287 of 1974 as amended by Act 18 of 1996 and Act 50 of 2017.

4.5 The Owner, Architect, and Construction Manager will not be responsible for the adequacy of data furnished to prospective Bidders on subsurface conditions, underground facilities, and other physical conditions. This information is provided based on information available. Bidder assumes responsibility for verifications, adjustments, and modifications that may be required since this is generally recognized as inherent to the work of the Contract Documents.

4.6 Before submitting a Bid, each Bidder will, at Bidder's expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions (surface, subsurface, and underground facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

4.7 On request in advance, Owner will provide each Bidder access to the site to conduct such explorations and tests, as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up, and restore the site to its former condition upon completion of such explorations.

4.8 The lands upon which the Work is to be performed, rights-of-way, and easements for access thereto and other lands designated for use by the Bidder in performing the Work are identified in the Contract Documents. All additional lands and access

thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Bidder. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

4.9 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Bidding Documents and, that without exception, the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

5. Scope

5.1 Contracts will be awarded in (4) prime contracts: Separate bids shall be submitted for: (BP-01) General Construction (includes Civil Scope), (BP-02) Plumbing Construction (includes Fire Protection Scope), (BP-03) Mechanical Construction and (BP-04) Electrical Construction (includes Security, A/V, and IT Scope).

5.2 Each prime contractor shall furnish all labor, equipment, and materials necessary to complete the work called for and implied by the plans and specifications.

6. Time

6.1 The Contract Documents include potential assessment of Liquidated Damages. Refer to AIA Document A132 – 2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition.

7. Interpretations of Contract Documents Prior to Bidding

7.1 If any person submitting a bid for construction of the Work is in doubt as to the true meaning or intent of any part of the proposed Contract Documents, or find discrepancies or omissions, they shall submit a request for information via PennBid to the Architect and Construction Manager no later than the date indicated in the Bid Schedule **(December 4, 2026 by 2:00 pm)**

7.2 Interpretation or correction of proposed Contract Documents will be made only by Addendum and will be released to all prime contract bidders of record, via PennBid. The Owner, Architect, and Construction Manager will not be responsible for any other explanations or interpretations of the proposed Contract Documents.

7.3 During the bidding period, Bidders may be furnished these Bid Addenda modifying the Bid Documents. Any such Addenda shall be taken into account in submitting a Bid and shall form a part of the Contract Documents. Receipt of Bid Addenda must be identified on Bid Form via PennBid

7.4 When mistakes or omissions occur in the drawings and/or specifications, they shall be brought to the Construction Manager’s attention before proceeding with the work.

7.5 All construction shall be in accordance with all federal, state, and local building codes

and ordinances, which shall take precedence over these drawings and specifications.

7.6 Manufacturer's directions – All manufacturer's articles, materials and equipment shall be supplied, installed, connected, cleaned or conditioned in strict accordance with the manufacturer's printed directions.

7.7 If there is a discrepancy between the contract documents and the information on PennBid, the contract document requirements shall prevail in all cases.

8. Requests for Information

8.1 If additional information is required concerning the meaning or intent of the Bid Documents, all questions and requests for information must be submitted electronically via PennBid.

9. Proposals

9.1 All bids shall be submitted electronically via PennBid.

Each Bid shall identify the prime contract. All bids MUST include items A through F to be considered a complete bid. Awarded Contractors are subjected to PennBid fees.

Each electronic bid shall include (1) copy of the following (note, hard copies may be required after bid submission, if required by the Owner or CM):

A. Bid Form, Signed and Sealed, with PennBid Table and questionnaire
B. Bid Bond, Signed and Sealed, or other form of Bid Security acceptable to Owner as identified herein.
C. Agreement of Surety, including Power of Attorney, Signed and Sealed
D. Non-Collusion Affidavit, Signed and Sealed
E. Non-Discrimination Clause, Signed and Sealed
F. PA Public Works Employment Verification Form (E-Verify)

Additional submission required after bid submission once requested by the Construction Manager within 48 hours of the request.

1. Bidders Qualifications, AIA A305, completed
2. A Schedule of Values, based on the specification sections of the Project Manual
3. List of Subcontractors

Submissions will be required after Letter of Intent Issued:

- Performance and Payment Bond (100%)
- Certificate of Insurance
- No Lien Agreement
- Maintenance Bond at a later date

10. Bidders Responsibilities

10.1 Bidders will be given permission to withdraw any proposal after it has been received by the Owner, provided the Bidder or his agent duly authorized to act for him, personally appears at the Owner's Business Office with a written request signed by the Bidder prior to the time set forth for the opening of the Bids. At the time set for the opening of Bids, the withdrawn proposal will be returned to the Bidder. Such withdrawn proposals will not be opened or read at the Bid opening. Bids may not be modified after submittal.

10.2 Bids shall be irrevocable for ninety (90) days after the actual day of opening thereof unless the Owner is delayed in awarding the Contract due to the failure to receive a required approval/permit from one or more reviewing bodies/governmental agencies having jurisdiction over the Project, the sale of bonds or the award of a grant, in which case, Bids shall be irrevocable for (120) calendar days after Bid opening. Absent an exception for extending time for the award of the Contract, the Owner and the lowest responsible and responsive Bidder may mutually agree in writing to extend the time for the Owner to award the Contract.

10.3 Neither the designation of the apparent lowest responsible Bidder, nor the issuance of a Notice of Intent to Award to the Bidder so designated shall operate to release any other Bidder from its Bid. Each such other Bidder, unless earlier released from its Bid by specific action of the Owner, shall remain bound by its Bid until the earlier of (1) the date of actual execution by Owner of the Agreement Between Owner and Contractor with the Bidder whom the Award of Contract has been made, or (2) the expiration of the firm Bid period stipulated above.

10.4 Negligence by the Bidder in preparing his Bid confers no right of withdrawal or modification of his proposal after such proposal has been opened. No claims on account of mistakes or omissions of any proposal will be considered. Notwithstanding the above, a Bidder may withdraw his Bid within two (2) business days after the Bid opening time in accordance with the Public Contracts – Withdrawal of Bids Law, Act of January 23, 1974, P.L. 9, No. 4, 73 P.S. §1601 et seq., as amended. A Bid which has been opened may be withdrawn only in accordance with the causes set forth in said Act and for no other reasons. Strict compliance with said Act is required to withdraw a Bid after opening.

10.5 By submitting a bid, the bidder covenants and agrees that he has carefully examined the site, the existing building and details, the documents and the Contract and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the general and local conditions and all matters which may in any way affect the work or its performance and that as a result of such examination, he fully understands the intent and purpose thereof and his obligations thereunder, and that he will not make any claim for, or have any right to, damages because of any lack of information.

10.6 Each bidder is highly encouraged to visit the site to familiarize themselves with the existing conditions thereon pertaining to the work. The bidder shall examine all the documents relating to the Contract on which he is bidding before submitting a Bid. Each Contractor shall obtain the full knowledge by personal and careful inspection of all existing conditions at the site and of all requirements of the Bid Documents that

affect the work. The Contractor accepts all such conditions and requirements and hereby assumes all responsibilities and costs resulting from their failure to obtain full knowledge of them.

10.7 The Bids are to include all work as shown or specified, including but not limited to Unit Prices, Alternates and Allowances as may be requested or noted. These prices are important and should be carefully considered when Bids are submitted, and in the form, as quoted, on the Bid forms, attached to these specifications. It is requested upon any bidder, to include all Alternate Bids or Unit Prices. Should any bidder fail to submit requested Alternate Bids or Unit Prices the bidder will be responsible for his omission and shall have no claim against the Owner, should the Owner award the Contract to a bidder who has submitted a more satisfactory and complete bid.

10.8 Any Unit Prices furnished by the Bidder as part of his Proposal Form shall be made a part of the Agreement and shall be the basis of compensation for any Unit Price work required on the Project.

10.9 The Bidder shall identify and list Prior to Award of Contract each Major Subcontractor or material supplier, with their respective prices, to be used on this Project in accordance with the General Conditions of the Contract.

10.10 Bidders shall also secure and submit Major Subcontractors Qualification Statements accordingly as noted below.

10.11 Bidder warrants to execute the Contract, furnish required Bonds in form as incorporated in the contract documents and furnish required insurance certificates and other items, in amounts specified or required, by the owner. Bidder shall also warrant beginning work in accordance with the Project Contract agreement.

10.12 All permits and inspections shall be obtained by each prime contractor and paid for by the owner. The contractors will be required to pay all license and/ or registration fees by the local community.

10.13 A Waiver of Liens shall be signed by The Contractor as requested by the CM or prior to the beginning of the ordering of material and before any work is performed on the property. The Waiver of Lien to be filed and indexed in the Carbon County Prothonotary's Office is found as an attachment at the end of these specifications. The Contractor shall provide a Release of Liens for themselves and all suppliers prior to application of final payment.

10.14 All work to be in accordance with applicable codes and ordinances adopted and/or as amended by the local Municipality, and the Commonwealth of Pennsylvania, Pennsylvania Uniform Construction Code, Act 45, The International Code Council, International Building Code – 2018 and Chapter 11 of the IBC 2021

10.15 This Project falls under the Commonwealth of Pennsylvania Public Works Employment Verification Act, Act 127 of 2012, 43 P.S. § 167.1, which requires all public work contractors and subcontractors to utilize the Federal Government's E-Verify system to ensure that all employees performing work on public work projects are authorized to work in the United States. All Bidders are required to submit a Public Works Employment Verification Form as a precondition for the Contract Award.

10.16 Documents required with Bid Submission:

A. Bid Form, Signed and Sealed with PennBid Table and questionnaire;
B. Bid Bond, Signed and Sealed or other form of Bid Security acceptable to the Owner as Identified herein;
C. Agreement of Surety, including Power of Attorney, Signed and Sealed;
D. Non-Collusion Affidavit, Signed and Sealed;
E. Non-Discrimination Clause, Signed and Sealed;
F. PA Public Works Employment Verification Form (e-Verify)

Additional submissions required after Bid Submission once requested by the Construction Manager within 48 hours of the request:

1. Bidders Qualifications, AIA A305, completed
2. A Schedule of Values, based on the specification sections of the Project Manual
3. List of Subcontractors

Submissions will be required after Letter of Intent Issued:

- Performance and Payment Bond (100%)
- Certificate of Insurance
- No Lien Agreement
- Maintenance Bond at a later date

10.17 The "Bid Bond," A.I.A. Document No. A310, of the American Institute of Architects, 2010 Edition, is hereby made a part of the Specifications as bound herein. The Bond is subject to all modifications as set forth hereinafter.

9.17.1 A bank cashier's, bank treasurer's certified check or bid bond in favor of Carbon County in the amount of 10% of all base bids plus the amount of all add alternates, is required from each bidder and must be submitted electronically with the bid. It is understood the Bid Deposit will be forfeited to and retained by the owner as liquidated damages if the Proposal, or any part thereof, is accepted by the Owner and the Bidder fails to execute the contract and furnish Bonds within ten (10) days from the date of "Notice of Award". Should the owner fail to make any awards through no fault or failures on the part of the bidders, the Owner shall return said Bid Deposits.

9.17.2 Agreement of Surety: The "Consent of Surety" form is to be provided to the Owner along with the bid proposal should the bid deposit submitted be other than a "Bid Bond". Attached is a 1-page sample letter to be signed and sealed from a corporate surety agreeing to provide a Performance Bond and Payment Bond in favor of the Owner as required for faithful performance and proper fulfillment of the contract. The Agreement is subject to all modifications as set forth hereinafter.

9.17.3 Non-Collusion Affidavit: The "Non-Collusion Affidavit" form is to be provided to the Owner along with the bid proposal by all prospective bidders. Attached is a document to be signed by all prospective bidders and sealed by notary, assuring the owner that the proposal for work is being submitted in good faith and without collusion with any other contractors or sub-contractors. The Affidavit is subject to all modifications as set forth hereinafter.

9.18 Non-Discrimination Clause: The "Non-Discrimination Clause form is to be provided to the Owner along with the bid proposal by all prospective bidders. Attached is a document to be signed by all prospective bidders, assuring the

owner that the proposal for work is being submitted in good faith and without collusion with any other contractors or subcontractors. The Clause is subject to all modifications as set forth hereinafter.

9.19 Performance and Payment Bonds: The “Performance Bond” and the “Payment Bond,” A.I.A. Documents No. A312-2010, of the American Institute of Architects, are hereby made a part of the Specifications as bound herein. The Bonds are subject to all modifications as set forth hereinafter.

9.20 Maintenance Bond – the execution of a maintenance bond is required, per Section 00 4316.

9.21 Contractor's Qualification Statement

9.21.1 Each Bidder is required to submit a Contractor’s Qualification Statement (AIA A305-2020) with a sworn statement of his financial responsibility, technical qualifications and evidence that he has completed at least Five similar construction contracts within the last five (5) years, each with a minimum value of 75% of the total amount of the proposal submitted. In addition, the designated Project Manager and Superintendent must have at least ten (10) years’ experience in similar projects with similar values and phased construction. The Owner /CM has the right to reject a Project Manager or Superintendent if they do not specifically meet the qualifications.

9.22 In the event of a discrepancy between what is inserted on the PennBid website spreadsheet and the submitted written documentation, the written documents will be deemed controlling.

10 Rejection or Withdrawal of Proposals

10.1 A bidder on any Prime Contract may withdraw his bid from consideration within forty-eight (48) hours of the bid opening without forfeiture of the certified check, bank cashier’s check, surety bid bond or other security filed with the bid if the price bid was submitted in good faith, and the bidder submits credible evidence that the reason for the price bid being substantially lower was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetical error or an unintentional omission of a substantial quantity of work, labor, material or services made directly in compilation of the bid; provided, 1.) the mistake or error must be proven and submitted to the Owner / CM for review and approval: 2.) notice of a claim of the right to withdraw such bid is made in writing with the contracting body within two business days after the opening of bids; and 3.) the withdrawal of the bid would not result in the awarding of the contract on another bid of the same bidder, his partner, or to a corporation or business venture owned by or in which he has a substantial interest.. No bidder who is permitted to withdraw a bid shall supply any material or labor or perform any subcontract or other work on the project without written approval of the contracting body. No accepted bid may be withdrawn for ninety (90) calendar days after the Bid Opening. Initial determination as to whether there was a clerical mistake or arithmetical error or unintentional omission of substantial quantity of work, labor, material, or services will be within the discretion of the Architect, a representative of the Owner, with the assistance of the Construction Manager, and such decision shall be considered final and

determinative.

10.2 Bids may be modified or withdrawn within PennBid at any time prior to the due date and time listed in the Invitation to Bid.

10.3 The Municipality reserves the right to reject any bid received if the bidder's responses to the Contractor's Qualification Statement (AIA Document A305) fail to satisfy the Municipality that such bidder is qualified to carry out the obligations of the Contract and to complete work, as specified. By way of specific example, a default in a contract in the last five years will, absent extraordinary justification, disqualify a bidder, as will litigation on a construction contract which, in the past five years, resulted in an award against the interest of the bidder.

11 PA Prevailing Wage

11.1 The Schedule of Minimum Wages as determined by the Department of Labor and Industry, Commonwealth of Pennsylvania, is hereby made a part of this Specification. A copy of these rates is attached in Section 007343 Prevailing Wage Requirements.

11.2 Copies of these forms may be obtained from the Prevailing Wage Division. The Project is subject t o the Pennsylvania Prevailing Wage Act (Act of 1961, P.L. 987 No. 442) as amended. The pages titled, "Duties of Awarding Agencies Under Pennsylvania Prevailing Wage Act" may be obtained from the Prevailing Wage Division. These duties include requirements of both the awarding agency (Owner), the Contractor(s) and Subcontractors. It is understood that the Owner will comply with its required duties. The Contractor(s) and Subcontractors shall comply with all duties and instructions required of them. All items mentioned as "contract requirements" in the documents are hereby made a part of the contract to the same extent as if included in the Owner-Contractor Agreement.

11.3 "Payroll Certification for Public Works Projects". All Contractors and Subcontractors shall complete this form for each week worked on this project. Each Weekly Payroll Certification form shall be Notarized and forwarded to the Construction Manager for inclusion in the Owner's records. Payroll Certification Forms covering work periods included in an application for payment shall be submitted before or with the respective Application For Payment. If the certifications Forms are not submitted with the Application for Payments, the Owner will withhold payment until received.

11.4 US Steel Act 132. The Steel Products Procurement Act, 73 P.S. §§1881-1887, and the Trade Practices Act, 71 P.S. §773.101 et seq.

11.4.1 If any steel products are to be used or supplied in the performance of the Contract, only steel products produced in the United States shall be used or supplied in the performance of the Contract or any subcontract thereunder. This provision shall not apply in any case where the head of the public agency, in writing, determines that the type of steel products necessary to the performance of the Contract are not produced in the United States in sufficient quantities to meet the requirement of the Contract.

11.4.2 Contractors must ensure compliance with all provisions of the above which

place restrictions upon the source of certain steel, cast iron and aluminum products allowed to be used in the performance of public agency contracts. The provisions of the above sited statutes are incorporated herein as if the same were set out at length herein.

11.4.3 Bidding will be public and utilize Pennsylvania State Prevailing Wage Rates established by the Commonwealth of PA Department of Labor and Industry.

12 Indemnity

12.1 The undersigned shall indemnify and hold harmless Upper Providence Township, New Road Construction Management, Inc., all consultants and each officer and employees, MKSD, LLC, Barry Isett and Associates, HB Engineers, Inc. and JP Kelly Engineers with respect to any claims, losses, expenses, costs and reasonable attorney's fees incurred by Upper Providence Township, New Road Construction Management, Inc., all consultants and each officer and employees, MKSD, LLC, Barry Isett and Associates, HB Engineers, Inc. and JP Kelly Engineers with regard to the undersigned's failure to comply with these Bid Documents and procedures.

12.2 Additional Insureds: Upper Providence Township, its members, officers, employees and consultants, New Road Construction Management, Inc., MKSD, LLC, Barry Isett and Associates, HB Engineers, Inc. and JP Kelly Engineers shall be named as "Additional Insureds" under all policies of insurances. Coverage shall be primary and non-contributory.

13 Extra Work – No extra work will be considered unless the Upper Providence Township authorizes such work, in advance, in writing.

14 Safety and Health Regulations – The Bidder further agrees that should he enter into a Contract with the Upper Providence Township to perform all or any portion of the work included herein, he will comply with all the provisions of the Department of Labor, Occupational Safety and Health Administration, Safety and Health Regulations for Construction, contained in the Federal Register Volume 37, Number 243, Part II, dated Saturday, December 16, 1972.

15 Specification and Product Description

15.1 Substitute Material and Equipment – Proposal shall include furnishing and installing material in strict accordance with Contract Documents. No substitutions or deviations will be considered except as provided for in Contract Documents

15.2 Any product substitution requests must be made in writing including all product literature and specification at least ten (10) calendar days prior to the bid due date.

16 This project is financed by Upper Providence Township.

17 Opening of Proposals

17.1 Bids will be viewable to the public via PennBid shortly after bids are received.

17.2 The Owner will, as soon as practical, award the Contracts to the Bidders, and shall have the right to reject any or all Bids, to waive technical defects, and to accept or reject any part of any Bid if in the judgment of the Owner its best interest shall be served by such action; and the Bidder, in submitting a Bid accepts these conditions. No rights shall accrue to any person submitting a Bid or Proposal until such Bid has been accepted, and a contract awarded, and such contract completely executed in writing by both parties.

18. AWARD OF CONTRACT

18.1 The Owner's intent is to enter into Contracts with the lowest responsible and qualified Bidders.

18.2 The Owner reserves the right to reject any and all bids. The Owner reserves the right to waive non-material defects, informalities or technicalities in any Bid in accordance with law. The Owner reserves the right to disregard all nonconforming, non-responsive, unbalanced, or conditional bids. Also, Owner reserves the right to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive, or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Bidding Documents.

18.3 In evaluating Bids, Owner will consider the qualifications of such Bidders (see Article 3), whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

18.4 Owner may consider the qualifications and experience of Subcontractors, suppliers, and other persons or organizations proposed for any portions of the Work requested by Owner. Owner also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

18.5 Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualification, and financial ability of Bidders, subcontractors, suppliers, and other persons or organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

18.6 If the Contract is to be awarded, Owner will give the Successful Bidder a Notice of Intent to Award within sixty (60) days after the day of Bid

opening unless extended as set forth in these Instructions to Bidders.

18.7 The Owner reserves the right to waive non-material defects, informalities, or technicalities in any Bid in accordance with the law.

19. CONTRACT SECURITY & INSURANCE

19.1 The General Conditions set forth the Owner's requirements as to Performance Bonds, Payment Bonds, and insurance requirements.

19.2 The apparent low Bidder must provide Payment and Performance Bonds in the forms included in the Contract Documents and all Certificates of Insurance or other insurance information as required pursuant to the General Conditions of the Contract within ten (10) days of the issuance of Notice of Intent to Award. **Other bond forms will not be accepted**. Failure of the apparent low Bidder to provide original executed Payment and Performance Bonds in the required form within the required time will result in forfeiture of the Bid Security.

20. SIGNING OF AGREEMENT

When Owner/Construction Manager issues a Notice of Intent to Award to the Successful Bidder, the Successful Bidder shall within ten (10) days thereafter, deliver to the Owner/Construction Manager, four (4) original copies of the required bonds, insurance certificates, and any other documents that may be requested with the Notice of Intent to Award. Within ten (10) days thereafter, the Construction Manager will send contract agreements via DocuSign to Successful Bidder. The Successful Bidder shall sign the agreements and DocuSign will automatically send the agreements to the Owner for signature. Once signed by the Owner DocuSign will automatically return an executed agreement to all parties.

21. RETAINAGE

Retainage will be in accordance with the Contract Documents. Reference Article 9 of the General Conditions.

22. PREVAILING WAGES

Pennsylvania Prevailing wage rates will apply to this project. The Contractor and its subcontractors shall comply with the provisions, duties, obligations, remedies, and penalties of the Pennsylvania Prevailing Wage Act, 43 P.S. § 165-1 et seq. which is incorporated herein by reference as if fully set forth herein. The general prevailing minimum wage rates, as determined by the Secretary of Labor and Industry shall be paid for each craft or classification of all workmen needed to perform work on the Project during the term hereof for the locality in which the work is to be performed. Reference Article 16.3 of the General Conditions.

23. COMPETENT WORKMEN

No person shall be employed to perform any work under the Contract if they are not legally eligible to be employed under applicable state and federal law or if they are not a trained, competent workman, or mechanic, as applicable. For purposes of this Section, no workman or mechanic, as applicable, shall be regarded as competent unless he shall be duly skilled in the applicable branch of labor, and paid the applicable prevailing wage pursuant to Article 16.3 of the General Conditions.

23.1 The Commonwealth of Pennsylvania enacted Act 127 of 2012, known as the Public Works Employment Verification Act ('the Act') which requires all public work contractors and subcontractors to utilize the Federal Government's E-Verify system to ensure that all employees performing work on public work projects are authorized to work in the United States. The Contractor and its Subcontractor (as such term is defined in the Act) are required to comply with the Act and the Statement of Policy as published in the Pennsylvania Bulletin, December 29, 2012, and effective January 1, 2013. Reference Article 16.4 of the General Conditions. The Public Works Employment Form (E-Verify) is included as Exhibit ITB-A to these Instructions to Bidders.

23.2 Criminal History and Child Protective Service Information: Prior to commencing the Work, the Contractor shall supply the Owner with state and federal criminal history reports and child abuse clearances for all employees, agents, and Subcontractors who will be on the Owner's property. Refer to Article 16.10 of the General Conditions for clearance requirements. Clearance forms are included as Exhibits ITB-B, ITB-C, ITB-D, ITB-E, and ITB-F to these Instructions to Bidders.

24. PENNSYLVANIA HUMAN RELATIONS ACT 222:

Reference Article 16.2 of the General Conditions.

25. NON-DISCRIMINATION:

Reference Article 16.9 of the General Conditions.

26. ANTI-POLLUTION LEGISLATION

Reference Article 16.7 of the General Conditions.

27. EROSION CONTROL

The Successful Bidders shall comply with all rules and regulations of Chapter 102, Title 25 of Pennsylvania Code, relating to Soil Erosion and Sedimentation Control. Reference Article 16.8 of the General Conditions.

28. PUBLIC WORKS CONSTRUCTION CONTRACTS

In consideration of the funds awarded and activities funded under the Contract which involves construction, reconstruction, alteration, repair, improvement, or maintenance of a building, structure, or improvement ("The Work"), the Successful Bidder agrees to perform in accordance with the following:

28.1 Steel Products Procurement Act. Reference Article 16.6.1 of the General Conditions.

28.2 Trade Practices Act. Reference Article 16.6.2 of the General Conditions.

28.3 Public Works Contractor's Bond Law of 1967. Prior to the award of any Contract for any Work on the Project, the contractor to whom the contract is to be awarded must furnish the following bonds which shall become binding upon the award of such Contract:

28.3.1 A performance bond at 100 percent of the Contract Sum, conditioned upon the faithful performance of the Contract in accordance with the plans, specifications, and conditions of the Contract. Such bond shall solely for the protection of the Owner which awarded said contract.

28.3.2 A payment bond at 100 percent of the Contract Sum. Such bond shall be solely for the protection of claimants supplying labor or materials to the Successful Bidder, its contractor(s) or to any of its Subcontractors, in the prosecution of the work provided for in such Contract and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the Work. "Labor or materials" shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site.

28.3.3 Reference Article 11.1.2 of the General Conditions for additional requirements.

29. SEVERABILITY

29.1 Should any section or any part of any section of the Contract be rendered void, invalid, or unenforceable by any court of law, for any reason, such a determination shall not render void, invalid, or unenforceable any other section or part of any section of the Contract.

30. AMERICANS WITH DISABILITIES ACT

During the term of this Contract, the Successful Bidder agrees as follows:

30.1 Pursuant to federal regulations promulgated under the authority of The Americans with Disabilities Act, 28 C.F.R. § 35.101 et. Seq., the Successful Bidder understands and agrees that no individual with a disability shall, on the basis of the disability, be excluded from participation in this Contract or

from activities provided for under this Contract. As a condition of accepting and executing the Contract, the Successful Bidder agrees to comply with the General Prohibitions Against Discrimination, 28 C.F.R. § 35.130, and all other regulations promulgated under Title II of The Americans with Disabilities Act which are applicable to all benefits, services, programs, and activities provided by the Commonwealth of Pennsylvania through contracts.

31. HEALTH AND SAFETY

32.1 Reference Article 10 of the General Conditions.

32. BONDS & INSURANCE

32.1 The Bidder will be required to furnish a Bid Bond, Performance Bond, and Labor and Material Payment Bonds in the amount of one hundred percent (100%) of the Contract Price in the form provided in the Contract Documents. Said Sureties shall be listed on the current Federal Register and have an AM Best rating of 'A-' or better and a financial rating of Class X or higher.

32.2 Insurance companies must be rated 'A-' or better in A.M. Best.

32.3 Bidder shall include the cost of the Bonds & Insurance in their Bid.

32.4 Bidder shall provide the insurance required in the General Conditions.

33. PRE-BID CONFERENCE

33.1 The NON-mandatory Pre-bid Conference will be held on the date and time listed in the Advertisement for Bids. Representatives of Owner, Construction Manager, and Architect will be present to discuss the Project. CM will transmit to all prospective Bidders of record such Addenda, as CM considers necessary in response to questions arising at the Conference.

34. PROJECT FINANCING

The Work to be done under the Contract is public work and may be financed in whole or part by the Owner (a public body) by issuance of bonds, which are subject to various qualifications and restrictions. The Owner, in such case and in good faith, intends to consummate such financing, but its ability to do so is subject to many factors beyond its control. It is therefore expressly understood and agreed to by each Bidder that, notwithstanding any other provision of the Contract Documents, the Owner may at any time cancel any award made by it, or cancel any contract entered into with any Bidder, without liability to the Bidder, at any time before the Bidder has been given written notice to proceed and has actually begun Work under the Contract if financing satisfactory to the Owner cannot reasonably be consummated as contemplated, or if any court of competent jurisdiction shall enjoin or otherwise prohibit the Owner from proceeding with the Work.

35. FAILURE TO EXECUTE CONTRACT

Failure of the Successful Bidder to whom Notice of Intent to Award has been given to deliver appropriate Payment and Performance Bonds, Certificates of Insurance, or execute the Contract within the time specified, shall constitute a default by such Bidder and the Owner may, at its sole discretion, award the contract to the next lowest responsive and responsible Bidder or re-advertise for Bids, and the defaulting Bidder shall pay to the Owner the difference between the amounts of his Bid and any higher amount for which the Owner may contract for the required work, plus any advertising, consulting, legal or other expenses incurred by reason of the default. The Bid Security of such defaulting Bidder shall be applied on account of said damages, and if the amount of said damages exceeds the amount of the Bid Security, the defaulting Bidder shall pay to the Owner the full amount of the excess.

SECTION 00 1110 – PROJECT DIRECTORY

Upper Providence Township
Barry Luber, Township Manager
Email: bluber@UpperProvidence.org
935 N. Providence Rd.
Media, Pa 19063
Phone: 610-565-4944, ext 102

Architect – MKSD, LLC
Nick Hewes, RA
Email: nick@mksdarchitects.com
1209 Hausman Rd, Suite A
Allentown, PA 18104
Phone: 610-366-2081

MPFPE Engineers – HB Engineers, Inc.
Thomas Hoffman, Engineer
Email: thoffman@hbengineersinc.com
2900 Hamilton Blvd, Suite 200
Allentown, PA 18103
Phone: 610-395-0130

Structural Engineers – Barry Isett & Associates
Betsy Faust, Engineer
Email: EFaust@barryisett.com
5420 Crackersport Rd
Allentown, PA 18104
Phone: 484-866-4826

Construction Manager – New Road Construction Management
Nick Saunders, CCM
Email: nsaunders@newroadcm.com
95 W Court St
Doylestown PA 18901
Phone: 215-933-9951

This information is provided for the convenience of all parties and may be subject to change. All contacts shall be made through New Road Construction Management

Bid Schedule

Advertisement #1	Week of November 12, 2026
Advertisement #2	Week of November 16, 2026
Non- Mandatory Pre-Bid Meeting	Monday, November 23, 2026
Final Day to Submit RFIs via PennBid	Tuesday, December 8, 2026 by 5:00 pm EST
Final Addendum to Bidders	Friday, December 11, 2026
Accept Bids/Bid Opening via PennBid	Thursday, December 17, 2026 2:00pm via PennBid
New Road De-Scope Bids and Bid Tab Preparation	Friday, December 18, 2026
New Road Recommendation of Award Letter	Monday, January 4, 2027
Special Council Meeting to Award Bid	Tuesday, January 12, 2027
New Road Notice to Proceed Letter for Procurement and Administration Only	Wednesday, January 13, 2026
Contracts, Bonds, COI, etc.	Friday, February 26, 2027
Notice to Proceed On-Site construction	April 1, 2027

SECTION 00 1155 – LETTER OF INSURER

DATE: _____

TO: Barry Luber, Township Manager
935 N. Providence Rd.
Media, Pa 19063

Dear Mr. Luber:

The undersigned insurance agent, licensed to do business in the Commonwealth of Pennsylvania and authorized to issue this letter on behalf of the following insurance company or companies:

_____

_____

hereby represents that if

_____
(Insert name of Bidder)

is awarded the contract for the construction of the project, as is described in the Contract for Construction, then the above-named insurance company or companies will issue insurance, naming Upper Providence Township and its consultants, New Road Construction Management and all consultants, MKSD Architects and all consultants, and each of the above named officers, agents, and employees as additional insured, for the coverages and in the amounts required by the Contract Documents, as set forth in Article 11 of the General Conditions.

_____
(Name of Agent)

By: _____
(Authorized Representative)

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Upper Providence Twp Municipal Complex Renovations & Addition
935 N Providence Rd,
Media, PA 19063

GENERAL CONTRACTOR – Bid Package BP-01

Bids Due: December 17, 2026 by 2:00 pm

Bidder Company Name: _____

Bidder Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

- The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

- BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. This Bid will remain open for NINETY (90) days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award.

- In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

    - BIDDER has examined copies of all Contract Documents, Advertisement to Bid, and the Instructions to Bidders. Additionally, the Bidder hereby acknowledges receipt of the following addenda by their initials:

        Addendum (No. & Initial): ***** ENTER ON PENNBID *****

    - BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit the project site shall be no reason for future request for additional compensation or costs of any kind.

    - This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, form, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or OWNER.

    - Liquidated damages for failure to meet substantial completion of each phase shall be calculated at the following rates for each calendar day of delay until the work is substantially complete

SUBMIT INFORMATION ON PENNBID

- One Thousand Dollars ($1,000.00) per calendar day for General Construction contract

- The BIDDER agrees to perform the various items of Work for the following Lump Sum Prices:

Base Bid Proposal:

-Base Bid Price for all work indicated on the Contract Documents.
-Base Bid Price must **INCLUDE ALL** Allowances for all work indicated on the Contract Documents.
-Base Bid Price **EXCLUDES** Unit Prices itemized later in this Bid Form.

****ENTER ALL PRICING ON PENNBID****

BASE BID:

_____ * * * _____ Dollars.
(Words)

($_____ * * * _____)
(Figures)

- OWNER CONTINGENCY ALLOWANCE:

The Construction Manager must review with the Owner and approve all allowance work prior to the Contractor performing the Work. Should the allowance amount be exceeded, the Contractor will be paid by Change Order addition for the related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused quantity by a Change Order credit. All allowances MUST have all OH&P included within the allowance and bid. NO additional OH&P will be allowed in allowances.

BIDDER agrees to include in the Base Bid Price, in addition to the Work shown on the Drawings and Specifications the following:

GC-1 Owner Contingency Allowance, General Construction Contract:
$50,000.00 (Fifty Thousand Dollars)

GC-2 Marquee Site Signage Allowance:
$35,000.00 (Thirty Five Thousand Dollars)

GC-3 Exterior Building Signage Allowance:
$15,000.00 (Fifteen Thousand Dollars)

GC-4 Sitework Allowance:
$15,000.00 (Fifteen Thousand Dollars)

- **ALTERNATES:** The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the low bidder. The Bidder agrees that the contract time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such Alternate descriptions. The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the base bid or other alternate. Alternates Prices shall include the cost of furnishing, installing all materials, labor, tools, equipment and other incidentals necessary to complete the work in accordance with the design intent, manufacturers' recommendations, building codes and the project specifications. Do not adjust material allowance under any alternate bid items. Indicate whether alternate price is an add or deduct when a choice is provided.

****ENTER ALTERNATE PRICING ON PENNBID.****

SUBMIT INFORMATION ON PENNBID

ALTERNATE No. 1: The Contractor shall state the adjustment in price to the Base Bid to remove all existing asphalt shingle roofing & underlayment at the District Court building (new Police Station), and replace with new Architectural Style Asphalt/Fiberglass roof shingles over 30# Felt. Install Ice and water shield 6-ft wide at eave and 3-ft wide at valley and roof edge. New metal drip edge and flashing to be installed, as well as continuous ridge vent. Replace any pipe boots / vent flashing. Assume existing sheathing can be re-used. Color and style to match the Administration Building roofing.

ADD/DEDUCT _____ * * * _____ Dollars.
(Words)

($ _____ * * * _____)
(Figures)

ALTERNATE No. 2: The Contractor shall state the adjustment in price to the Base Bid to remove all existing windows around the Township Administration building and replace, including frames, glazing, flashing, sealants, hardware and associated accessories. Includes 25 double-hung fiberglass composite windows, with factory applied powder-coat finish, tile-in sashes, and muntin patterns to match existing. Basis of Design = the "Impervia Series" by Pella.

ADD/DEDUCT _____ * * * _____ Dollars.
(Words)

($ _____ * * * _____)
(Figures)

ALTERNATE No.3: The Contractor shall state the adjustment in price to the Base Bid to Install a sealed concrete floor finish for Gym 231 instead of Rubber Flooring RF-1 as indicated on the Contract Documents.

ADD/DEDUCT _____ * * * _____ Dollars.
(Words)

($ _____ * * * _____)

ALTERNATE No.4: The Contractor shall state the adjustment in price to the Base Bid to Install a new carport / canopy behind the Township Administration building, as indicated on the Contract Documents.

ADD/DEDUCT _____ * * * _____ Dollars.
(Words)

($ _____ * * * _____)

SUBMIT INFORMATION ON PEN BID

- **UNIT PRICES**: OWNER shall make adjustments to the Contract based on the actual field conditions encountered using the Unit Prices included with the proposal. The BIDDER agrees that OWNER reserves the right to reject or otherwise not agree to use the Unit Prices submitted, if in the Owners opinion, the nature or quantity of the Work encountered is such that the unit price cost no longer applies to the Work. The Owner also reserves the right to solicit independent proposals as required by Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid, and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from OWNER. Unit Prices shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidental costs necessary to complete the specified operation. Unit prices will be used to ADD/DEDUCT the contract cost where appropriate. The Bidder agrees that in the event of any inconsistency between a Unit Price and the extension of a Unit Price in a Material Allowance, the Unit Price shall control, the Material Allowance extension shall be recalculated.
- ***ENTER UNIT PRICES ON PENNBID.***

UNIT PRICE 1: BIDDER agrees to excavate, form and install new concrete curb on site at the following unit price:

The contract Unit Price per linear foot for Unit Price 1 is**:** **$_____per LF**

UNIT PRICE 2: BIDDER agrees to furnish and install exterior concrete sidewalk or flatwork including excavation and consisting of 6" stone base and 5" concrete:

The contract Unit Price per square foot for Unit Price 2 is: **$_____per SF**

UNIT PRICE 3: BIDDER agrees to furnish and install bituminous asphalt paving including excavation and consisting of stone base 6", base course 4" and topping 2":

The contract Unit Price per square foot for Unit Price 3 is: **$_____per SF**

.

UNIT PRICE 4: BIDDER agrees to furnish and install exterior grade plywood sheathing to replace any damaged existing roof sheathing during roof replacement (if Bid Alternate No 1 is accepted)

The contract Unit Price per square foot for Unit Price 4 is: **$_____per sheet of plywood**

- Bidder accepts the provisions of the Agreement as to the liquidated damages in the event of failure to complete the Work by the dates and milestones defined in the Contract Documents.
- In submitting this Bid, it is understood that the OWNER reserves the unrestricted right to reject any and all bids, or to waive any informalities or technicalities in said Bids.
- Bidder understands that Owner reserves the right to consider Alternates Prices in determining the low bidder. All Alternate Prices shall include costs for furnishing and installing all materials, labor, tools equipment, and other incidentals necessary to complete the specified operation in accordance with the Project Specifications and the manufacturer's recommendations.

SUBMIT INFORMATION ON PENNBID

Accompanying this Bid is Security in the form of _____ * * * _____ in the amount of ten percent (10%) of the total of the Base Bid and all possible add alternates.

In witness whereof, the undersigned has caused this Proposal to be executed this _ _day of_ ____ ___ 20__.

INDIVIDUAL, PARTNERSHIP OR CORPORATION

_____
(Firm Name)

By _____
(Signature)

_____
Print Name of Person Authorized to Sign Title

State of Incorporation _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest by

_____
Print Name of Person

_____
Corporate Seal

SUBMIT INFORMATION ON PENNBID

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Upper Providence Twp Municipal Complex Renovations & Addition
935 N Providence Rd,
Media, PA 19063

PLUMBING CONSTRUCTION – Bid Package BP-02

Bids Due: December 17, 2026 by 2:00 pm

Bidder Company Name: _____

Bidder Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

- The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

- BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. This Bid will remain open for NINETY (90) days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award.

- In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

    - BIDDER has examined copies of all Contract Documents, Advertisement to Bid, and the Instructions to Bidders. Additionally, the Bidder hereby acknowledges receipt of the following addenda by their initials:

        Addendum (No. & Initial): ***** ENTER ON PENNBID *****

    - BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit the project site shall be no reason for future request for additional compensation or costs of any kind.

    - This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, form, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or OWNER.

    - Liquidated damages for failure to meet substantial completion of each phase shall be calculated at the following rates for each calendar day of delay until the work is substantially complete

        - One Thousand Dollars ($1,000.00) per calendar day for Plumbing Construction contract

SUBMIT INFORMATION ON PENNBID

- The BIDDER agrees to perform the various items of Work for the following Lump Sum Prices:

Base Bid Proposal:

-Base Bid Price for all work indicated on the Contract Documents.
-Base Bid Price must **INCLUDE ALL** Allowances for all work indicated on the Contract Documents.
-Base Bid Price **EXCLUDES** Unit Prices itemized later in this Bid Form.

****ENTER ALL PRICING ON PENNBID****

BASE BID:

_____ * * * _____ Dollars.
(Words)

($_____ * * * _____)
(Figures)

- OWNER CONTINGENCY ALLOWANCE:

The Construction Manager must review with the Owner and approve all allowance work prior to the Contractor performing the Work. Should the allowance amount be exceeded, the Contractor will be paid by Change Order addition for the related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused quantity by a Change Order credit. All allowances MUST have all OH&P included within the allowance and bid. NO additional OH&P will be allowed in the allowances.

BIDDER agrees to include in the Base Bid Price, in addition to the Work shown on the Drawings and Specifications the following:

PC-1 Owner Contingency Allowance, Plumbing Construction Contract:
$7,500.00 (Seven Thousand Five Hundred Dollars)

PC-2 Owner Contingency Allowance, Fire Protection:
$5,000.00 (Five Thousand Dollars)

- Bidder accepts the provisions of the Agreement as to the liquidated damages in the event of failure to complete the Work by the dates and milestones defined in the Contract Documents.

- In submitting this Bid, it is understood that the OWNER reserves the unrestricted right to reject any and all bids, or to waive any informalities or technicalities in said Bids.

- Bidder understands that Owner reserves the right to consider Alternates Prices in determining the low bidder. All Alternate Prices shall include costs for furnishing and installing all materials, labor, tools equipment, and other incidentals necessary to complete the specified operation in accordance with the Project Specifications and the manufacturer's recommendations.

SUBMIT INFORMATION ON PENNBID

Accompanying this Bid is Security in the form of _____ * * * _____ in the amount of ten percent (10%) of the total of the Base Bid and all possible add alternates.

In witness whereof, the undersigned has caused this Proposal to be executed this _ _day of_ ____ ___ 20__.

INDIVIDUAL, PARTNERSHIP OR CORPORATION

_____
(Firm Name)

By _____
(Signature)

_____
Print Name of Person Authorized to Sign Title

State of Incorporation _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest by

_____
Print Name of Person

_____
Corporate Seal

SUBMIT INFORMATION ON PENNBID

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Upper Providence Twp Municipal Complex Renovations & Addition
935 N Providence Rd,
Media, PA 19063

MECHANICAL CONSTRUCTION – Bid Package BP-03

Bids Due: December 17, 2026 by 2:00 pm

Bidder Company Name: _____

Bidder Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

- The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

- BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. This Bid will remain open for NINETY (90) days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award.

- In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

    - BIDDER has examined copies of all Contract Documents, Advertisement to Bid, and the Instructions to Bidders. Additionally, the Bidder hereby acknowledges receipt of the following addenda by their initials:

        Addendum (No. & Initial): ***** ENTER ON PENNBID *****

    - BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit the project site shall be no reason for future request for additional compensation or costs of any kind.

    - This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, form, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or OWNER.

    - Liquidated damages for failure to meet substantial completion of each phase shall be calculated at the following rates for each calendar day of delay until the work is substantially complete

        - One Thousand Dollars ($1,000.00) per calendar day for Mechanical Construction contract

SUBMIT INFORMATION ON PENNBID

- The BIDDER agrees to perform the various items of Work for the following Lump Sum Prices:

Base Bid Proposal:

-Base Bid Price for all work indicated on the Contract Documents.
-Base Bid Price must **INCLUDE ALL** Allowances for all work indicated on the Contract Documents.
-Base Bid Price **EXCLUDES** Unit Prices itemized later in this Bid Form.

****ENTER ALL PRICING ON PENNBID****

BASE BID:

_____ * * * _____ Dollars.
(Words)

($_____ * * * _____)
(Figures)

- OWNER CONTINGENCY ALLOWANCE:

The Construction Manager must review with the Owner and approve all allowance work prior to the Contractor performing the Work. Should the allowance amount be exceeded, the Contractor will be paid by Change Order addition for the related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused quantity by a Change Order credit. All allowances MUST have all OH&P included within the allowance and bid. NO additional OH&P will be allowed in the allowances.

BIDDER agrees to include in the Base Bid Price, in addition to the Work shown on the Drawings and Specifications the following:

MC-1 Owner Contingency Allowance, Mechanical Construction Contract:
$12,500.00 (Twelve Thousand Five Hundred Dollars)

- Bidder accepts the provisions of the Agreement as to the liquidated damages in the event of failure to complete the Work by the dates and milestones defined in the Contract Documents.

- In submitting this Bid, it is understood that the OWNER reserves the unrestricted right to reject any and all bids, or to waive any informalities or technicalities in said Bids.

- Bidder understands that Owner reserves the right to consider Alternates Prices in determining the low bidder. All Alternate Prices shall include costs for furnishing and installing all materials, labor, tools equipment, and other incidentals necessary to complete the specified operation in accordance with the Project Specifications and the manufacturer's recommendations.

SUBMIT INFORMATION ON PENNBID

Accompanying this Bid is Security in the form of _____ * * * _____ in the amount of ten percent (10%) of the total of the Base Bid and all possible add alternates.

In witness whereof, the undersigned has caused this Proposal to be executed this _ _day of_ ____ ___ 20__.

INDIVIDUAL, PARTNERSHIP OR CORPORATION

_____
(Firm Name)

By _____
(Signature)

_____
Print Name of Person Authorized to Sign Title

State of Incorporation _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest by

_____
Print Name of Person

_____
Corporate Seal

SUBMIT INFORMATION ON PENNBID

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Upper Providence Twp Municipal Complex Renovations & Addition
935 N Providence Rd,
Media, PA 19063

ELECTRICAL CONSTRUCTION – Bid Package BP-04

Bids Due: December 17, 2026 by 2:00 pm

Bidder Company Name: _____

Bidder Address: _____

_____

Contact: _____

Phone Number: _____

Email: _____

THIS BID FORM SHALL NOT BE ALTERED IN ANY MANNER. ANY ALTERED BID FORMS SHALL BE CONSIDERED NON-RESPONSIVE AND WILL BE REJECTED.

- The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the Contract Documents.

- BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. This Bid will remain open for NINETY (90) days after the day of Bid Opening. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within ten (10) days after the date of OWNER'S Notice of Award.

- In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

  - BIDDER has examined copies of all Contract Documents, Advertisement to Bid, and the Instructions to Bidders. Additionally, the Bidder hereby acknowledges receipt of the following addenda by their initials:

    Addendum (No. & Initial): ***** ENTER ON PENNBID *****

  - BIDDER has examined the site and locality where the Work is to be performed, the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress or performance of the Work and has made such independent investigations as BIDDER deems necessary. Failure to visit the project site shall be no reason for future request for additional compensation or costs of any kind.

  - This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, form, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or OWNER.

  - Liquidated damages for failure to meet substantial completion of each phase shall be calculated at the following rates for each calendar day of delay until the work is substantially complete

    - One Thousand Dollars ($1,000.00) per calendar day for Electrical Construction contract

SUBMIT INFORMATION ON PENNBID

- The BIDDER agrees to perform the various items of Work for the following Lump Sum Prices:

Base Bid Proposal:

-Base Bid Price for all work indicated on the Contract Documents.
-Base Bid Price must **INCLUDE ALL** Allowances for all work indicated on the Contract Documents.
-Base Bid Price **EXCLUDES** Unit Prices itemized later in this Bid Form.

****ENTER ALL PRICING ON PENNBID****

BASE BID:

_____ * * * _____ Dollars.
(Words)

($_____ * * * _____)
(Figures)

- OWNER CONTINGENCY ALLOWANCE:

The Construction Manager must review with the Owner and approve all allowance work prior to the Contractor performing the Work. Should the allowance amount be exceeded, the Contractor will be paid by Change Order addition for the related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused quantity by a Change Order credit. All allowances MUST have all OH&P included within the alowance and bid. NO additional OH&P will be allowed in the allowances.

BIDDER agrees to include in the Base Bid Price, in addition to the Work shown on the Drawings and Specifications the following:

EC-1 Owner Contingency Allowance, Electrical Construction Contract:
$20,000.00 (Twenty Thousand Dollars)

- **ALTERNATES:** The Bidder agrees that the Owner shall have the right to accept or reject any or all of the following alternates, which acceptance or rejection shall enter into the determination of the low bidder. The Bidder agrees that the contract time shall not be increased on account of the acceptance of any one or combination of alternates unless specifically stated in such Alternate descriptions. The Bidder agrees that the Owner shall have the right to accept an alternate that is higher in price than the base bid or other alternate. Alternates Prices shall include the cost of furnishing, installing all materials, labor, tools, equipment and other incidentals necessary to complete the work in accordance with the design intent, manufacturers' recommendations, building codes and the project specifications. Do not adjust material allowance under any alternate bid items. Indicate whether alternate price is an add or deduct when a choice is provided.

****ENTER ALTERNATE PRICING ON PENNBID.****

ALTERNATE No. 1: The Contractor shall state the adjustment in price to the Base Bid to Install new lighting and power for a new carport / canopy behind the Township Administration building, as indicated on the Contract Documents.

ADD/DEDUCT _____ * * * _____ Dollars.
(Words)

($_____ * * * _____)
(Figures)

SUBMITTED INFORMATION ON PENNBID

- **UNIT PRICES**: OWNER shall make adjustments to the Contract based on the actual field conditions encountered using the Unit Prices included with the proposal. The BIDDER agrees that OWNER reserves the right to reject or otherwise not agree to use the Unit Prices submitted, if in the Owners opinion, the nature or quantity of the Work encountered is such that the unit price cost no longer applies to the Work. The Owner also reserves the right to solicit independent proposals as required by Township guidelines, under a separate contract to perform the services required. **The responsiveness of the Bid, and if the Bid is responsible, may be determined by the Owner on the basis of the Unit Prices proposed by the bidder. Unit Prices shall be consistent with verifiable average costs for the work to be performed. Bidders agree that a proposal may be rejected if the Unit Prices submitted are inconsistent with the average cost.** Under NO circumstances will BIDDER perform Unit Price Work without prior written authorization from OWNER. Unit Prices shall include costs for furnishing and installing all materials, labor, tools, equipment, and other incidental costs necessary to complete the specified operation. Unit prices will be used to ADD/DEDUCT the contract cost where appropriate. The Bidder agrees that in the event of any inconsistency between a Unit Price and the extension of a Unit Price in a Material Allowance, the Unit Price shall control, the Material Allowance extension shall be recalculated.

  ENTER UNIT PRICES ON PENNBID.

  UNIT PRICE 1: BIDDER agrees to provide an additional duplex receptacle and 20A circuit, including 1000' of 12/2 mc-cable, box, faceplate and 100' one-way circuit distance.

  The contract Unit Price per outlet for Unit Price 1 is: $_____per Outlet

  UNIT PRICE 2: BIDDER agrees to provide an additional emergency relay device – dimming consisting of junction box, mounting equipment, cabling, conduit and all terminations and connections to the emergency circuit, emergency lights and local power pack.

  The contract Unit Price per Assembly for Unit Price 2 is: $_____per Assembly

  UNIT PRICE 3: BIDDER agrees to provide an additional exit sign assembly luminaire Type 'E1', including mounting equipment, up to 100' of wiring, with appropriate terminations and connections.

  The contract Unit Price per Fixture for Unit Price 3 is: $_____per Fixture

  UNIT PRICE 4: BIDDER agrees to provide an additional wall-mounted fire alarm pull station assembly consisting of pull station device, backbox, cabling, conduit, necessary wall penetration cutting and patching, terminations, connections to fire alarm system, required programming, and 200 feet of wiring.

  The contract Unit Price per device for Unit Price 4 is: $_____per device

  UNIT PRICE 5: BIDDER agrees to provide an additional wall-mounted fire alarm audio/visual device assembly consisting of device, backbox, cabling, conduit, necessary wall penetration cutting and patching, terminations, connections to fire alarm system, required programming, and 200 feet of wiring.

  The contract Unit Price per device for Unit Price 5 is: $_____per device

  UNIT PRICE 6: BIDDER agrees to provide an additional smoke detector device including 200 feet of wiring and accessories.

  The contract Unit Price per device for Unit Price 6 is: $_____per device

SUBMIT INFORMATION ON PENNBID

- Bidder accepts the provisions of the Agreement as to the liquidated damages in the event of failure to complete the Work by the dates and milestones defined in the Contract Documents.

- In submitting this Bid, it is understood that the OWNER reserves the unrestricted right to reject any and all bids, or to waive any informalities or technicalities in said Bids.

- Bidder understands that Owner reserves the right to consider Alternates Prices in determining the low bidder. All Alternate Prices shall include costs for furnishing and installing all materials, labor, tools equipment, and other incidentals necessary to complete the specified operation in accordance with the Project Specifications and the manufacturer's recommendations.

SUBMIT INFORMATION ON PENNBID

Accompanying this Bid is Security in the form of _____ * * * _____ in the amount of ten percent (10%) of the total of the Base Bid and all possible add alternates.

In witness whereof, the undersigned has caused this Proposal to be executed this _ _day of_ ____ ___ 20__.

INDIVIDUAL, PARTNERSHIP OR CORPORATION

_____
(Firm Name)

By _____
(Signature)

_____
Print Name of Person Authorized to Sign Title

State of Incorporation _____

Business Address: _____

_____

_____

Telephone Number: _____

Email Address: _____

_____
Attest by

_____
Print Name of Person

_____
Corporate Seal

SUBMIT INFORMATION ON PENNBID

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SECTION 00 1300 - BID SECURITY FORM

The Bid Security Form utilized for this project shall be a “Bid Bond”, AIA Document A310-2010, included herein, or an approved equal. Reference Section 00 1100, “Instructions to Bidders” for the execution of the Bid Bond.

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AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Upper Providence Township»«»
«935 N Providence Rd,
Media, PA 19063»

BOND AMOUNT: $ « »

PROJECT:
(Name, location or address, and Project number, if any)

«Upper Providence Township Municipal Complex Renovations & Addition»
«935 N Providence Rd, Media, PA 19063»

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1280005747)

Signed and sealed this « » day of « » , « »

	« »
	(Contractor as Principal) *(Seal)*
	« »
(Witness)	*(Title)*
	« »
	(Surety) *(Seal)*
	« »
(Witness)	*(Title)*

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User Notes: (1280005747)

SECTION 00 1310 – PROPOSAL CHECKLIST

The following represents a list of those Documents and materials, which will be required in connection with the Project. **Certain items will be required at time of the Bid submission; failure to submit them may result in disqualification of the Bid in accordance with Pennsylvania law; other items will be required after bid date but no later than time set for the Contract execution**. Specific review should be made of Bidding Documents contained in the Project Manual to ascertain what those Documents are and when they are required to be submitted.

Submissions required with the Bid:

[ ] Bid Form fully executed and notarized along with PennBid Bid Table and questionnaire

[ ] Bid Bond or Certified Check or Cashier's Check in the amount of 10% of the Bid total and shall include Consent of Surety and Power of Attorney, Signed and Sealed

[ ] Non-Collusion Affidavit, Signed and Sealed

[ ] Non Discrimination Clause, Signed and Sealed

[ ] PA Public Works Employment Verification Form (e-verify)

This checklist is submitted to the Bidders strictly as a courtesy and is not to be binding on the Owner. Responsibility for ascertaining and submitting the Documents needed for consideration of the Bid, and at appropriate time, falls upon each and every Bidder.

Submissions required after requested by the Construction Manager (within 48 hours):

[ ] Bidder's Qualifications, AIA A305, completed

[ ] A Schedule of Values.

[ ] List of Subcontractors.

Submissions required after Letter of Intent issued:

[ ] Performance and Payment Bond (100%)

[ ] Certificate of Insurance

[ ] No Lien Agreement

END OF SECTION 00 1310

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SECTION 00 1400 - AGREEMENT OF SURETY

(Note: This Agreement must be properly executed and must accompany the Certified Check, or Bid Bond, whichever is furnished as Bid Security.)

KNOW ALL MEN BY THESE PRESENTS, that we, _____, as Surety, a corporation existing under the laws of the State of _____, and authorized to transact business in the Commonwealth of Pennsylvania hereby agrees intending to be legally bound hereby, to execute and deliver to the Upper Providence Township, within the time limit specified in the Contract Documents, the Performance Bond and Payment Bond in the forms included in the Contract Documents each in an amount of 100% of the Contract Sum, in favor of the Upper Providence Township as required for the faithful performance and proper fulfillment of the contract for the Renovations and Addition to the Upper Providence Township Municipal Complex, 935 N Providence Rd, Media, PA 19063 on behalf of _____ (hereinafter called the Bidder) provided that the above contract be awarded to the Bidder within ninety (90) days after the date of opening of the bids or otherwise as set forth in the Instructions to Bidders.

Surety further agrees that should the Surety, after notification of intent to make such award, omit or refuse to execute the required bonds and agreement, then the Surety shall pay to the Lower Providence Township, hereinafter called the Obligee, any difference between the total amount specified in said Bidder's proposal for the required work and the amount of which said Obligee may procure the same work, if the latter amount be in excess of the former, plus any advertising, architectural, legal, and other expenses incurred by Obligee; provided, however, that the obligations of Surety hereunder shall not exceed the amount of bid security provided by the Bidder together with interest.

_____ _____

WITNESS CORPORATE SURETY

(Affix

_____ _____

Corporate
DATE SIGNATURE

Seal)

_____

_ ATTORNEY-IN-FACT*

NAME: _____
(Please Type)

*Attach an appropriate Power of Attorney, dated as of the same date as this Agreement, evidencing the authority of the Attorney-in-Fact to act on behalf of the Corporation.

END OF SECTION 00 1400

SECTION 00 1500 - NON-COLLUSION AFFIDAVIT OF CONTRACTOR

State of _____

County of _____

I state that I am _____ of _____
(Title) (Entity Name)
and that I am authorized to make this affidavit on behalf of said entity.

I state that:

1. The price(s) and amount(s) of this bid have been arrived at independently and without consultation, communication or agreement with any other contractor, bidder or potential bidder.

2. Neither the price(s) nor the amount(s) of this bid, and neither the approximate price(s) nor approximate amount(s) of this bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and they will not be disclosed before bid opening.

3. No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, or to submit a bid higher than this bid, or to submit any intentionally high or noncompetitive bid or other form of complementary bid.

4. The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid.

5. _____, its affiliates, subsidiaries, officers,
(Entity)
directors, and employees are not currently under the investigation by any governmental agency and have not in the last three years been convicted of or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding of any public contract, except as follows:

_____
_____
_____

I state that _____ understands and
(Name of Firm)
acknowledges that the above representations are material and important, and will be relied on by Wild Acres Lakes Property and Homeowners Association (WALPOA) in awarding the contract(s) for which this bid is submitted. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from WALPOA of the true facts relating to the submission of bids for this contract.

_____
Name:
Company/Firm Position:

Sworn to me and subscribed
before me this _____ day
of _____, 2025.

_____
Notary Public

Notary Seal:

(The Notary Seal must be placed on this page above.)

SECTION 00 1550 – NON-DISCRIMINATION CLAUSE

_____, hereinafter referred to as the CONTRACTOR, agrees as follows:

1. CONTRACTOR shall not discriminate against any employee, applicant for employment, independent contractor, or any other person because of race, color, religious creed, ancestry, national origin, age, or sex. CONTRACTOR shall take affirmative action to ensure that applicants are employed, and that employees or agents are treated, during employment, without regard to their race, color, religious creed, ancestry, national origin, age or sex. Such affirmative action shall include, but is not limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training. CONTRACTOR shall post in conspicuous places, available to all employees, agents, applicants for employment, and other persons a notice to be provided by the contracting agency setting forth the provisions of the non-discrimination clause.

2. CONTRACTOR shall, in advertisement or requests for employment placed by it or on its behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, religious creed, ancestry, national origin, age or sex.

3. CONTRACTOR shall send each labor union or worker's representative with which it has a collective bargaining agreement or other contract or understanding, a notice advising said labor union or workers' representative of its commitment to this non-discrimination clause. Similar notice shall be sent to every other source of recruitment regularly utilized by the CONTRACTOR.

4. It shall be no defense to a finding of non-compliance with the Contract Compliance Regulation Commission or this non-discrimination clause that the CONTRACTOR had delegated some of its employment practices to any union, training program, or other source or recruitment which prevents it from meeting its obligations. However, if the evidence indicates that the CONTRACTOR was not on notice of the third-party discrimination or made a good faith effort to correct it, such factor shall be considered in mitigation in determining appropriate sanctions.

5. Where the practice of a union or any training program or other source of recruitment will result in the exclusion of minority group persons, so that the CONTRACTOR will be unable to meet its obligations under the Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission or this non-discrimination clause, CONTRACTOR shall then employ and fill vacancies through other non-discriminatory employment procedures.

6. CONTRACTOR shall comply with the Contract Compliance Regulations of the Pennsylvania Human Relations Commission, 16 PA Code Chapter 49 and with all state and federal laws prohibiting discrimination in hiring or employment opportunities. In the event of the CONTRACTOR's noncompliance with the non-discrimination clause of this CONTRACT, or with any such laws, this CONTRACT may, after hearing and adjudication, be terminated or suspended, in whole or in part, and the CONTRACTOR may be declared temporarily ineligible for further contracts and other such sanctions may be imposed and

remedies invoked as provided by the Contract Compliance Regulations.

7. CONTRACTOR shall furnish all necessary employment documents and records to, and permit access to its books, records, and accounts by the contracting agency, the Office of Administration, Bureau of Affirmative Action, and the Human Relations Commission for purposes of investigation to ascertain compliance with the provisions of the Contract Compliance Regulations, pursuant to 49.35 of the regulations cited above (relating to information concerning compliance by contractors). If CONTRACTOR does not possess documents or records reflecting the necessary information requested, it shall furnish such information on reporting forms supplied by the contracting agency, the Bureau of Affirmative Action or the COMMISSION.

8. CONTRACTOR shall actively recruit minority subcontractor or subcontractors with substantial minority representation among their employees.

9. CONTRACTOR shall include the provisions of the non-discrimination clause in every subcontract, so that such provisions will be binding upon each subcontractor.

10. The terms used in this non-discrimination clause shall have the same meaning as in the Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission, 16 PA Code Chapter 49.

11. CONTRACTOR obligations under this clause are limited to the CONTRACTOR's facilities within Pennsylvania, or, where the contract is for the purchase of goods manufactured outside of Pennsylvania, the facilities at which such goods are actually produced.

CONTRACTOR: WITNESS:

_____

By:

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____, 20___.

Notary Public:
My Commission Expires:

SECTION 00 1910 – PERFORMANCE AND PAYMENT BOND

The Performance and Payment Bond to be executed on behalf of the Owner is the American Institute of Architects Document A312 "Performance and Payment Bond ", 2010 Edition, bound herein, is hereby made part of the Contract Documents. Other general industry accepted Performance and Payment Bond forms may also be accepted.

Document A312 is enclosed (2 page) following for each Prime Contractor's review.

END OF SECTION 00 1910

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DRAFT

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Upper Providence Township»«»
«935 N Providence Rd, Media, PA 19063»

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

«Upper Providence Township Municipal Complex Renovations & Addition»
«935 N Providence Rd, Media, PA 19063»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: **« »** None **« »** See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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User Notes: (1112959090)

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the

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User Notes: (1112959090)

Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

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User Notes: (1112959090)

§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

DRAFT

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User Notes: (1112959090)

DRAFT

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Upper Providence Township»«»
«935 N Providence Rd, Media, PA 19063»

CONSTRUCTION CONTRACT
Date: « »
Amount: $ « »
Description:
(Name and location)

«Upper Providence Township Municipal Complex Renovations & Addition»
«935 N Providence Rd, Media, PA 19063»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

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§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

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SECTION 00 1930 – MAINTENANCE BOND

Upper Providence Township Municipal Complex Renovations & Addition

18 MONTH MAINTENANCE BOND

(Please type or print clearly)

BOND # _____

(Renew each term with Maintenance Contract)

Know all men by these presents, that we, the undersigned_____as principal and as sureties, are hereby held and firmly bound unto the Upper Providence Township, as Obligee, in the penal sum of_____dollars, (15% of Contract Amount) for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this_____day of_____, 20___.

The condition of the above obligation is such that whereas, the above named principal did on the day of____, 20___, enter into a contract with_, which said contract is made a part of this the bond the same as though set forth herein:

Now, if said_____shall well and faithfully do and perform the things agreed by_____to be done and performed according to the terms of said contract, and shall pay all lawful claims for subcontractors, materialmen, laborers, persons, firms or corporations for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing said contract, we agreeing and assenting that this undertaking shall be for the benefit of any subcontractor, materialmen, laborer, person, firm or corporation having a just claim, as well as for the Obligee herein; and shall continue said obligation for twelve months from the date of completion and acceptance of the work to be performed under the said contract to guarantee against defects in the work, which, in the judgment of the Obligee or its successors or assigns having jurisdiction in the premises, are caused by defective or inferior materials and/or workmanship, then this obligation shall be void; otherwise the same shall remain in liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in anywise affect the obligation of said surety on its bond.

The Principal and the Surety agree that in case of default in and/or any action arising out of this Bond, the Obligee or any person, association, partnership and/or corporation who shall be entitled to institute and maintain an action upon this Bond, as above provided, may use, for the purpose of the establishment of the claim, a copy of this Bond, duly certified by the Obligee to be true and correct, and the Principal and the Surety agree that any action instituted upon any part of this

Bond shall not be a bar to any subsequent action upon the same part or any other part of this Bond.

Each reference in this Bond to the Obligee shall also include the officers, employees and representatives of said Obligee.

It is the intention of the parties hereto to be legally bound by this instrument.

IN WITNESS WHEREOF, THE said Principal and Surety have duly executed this Bond in triplicate under seal and day and year first above written.

SIGNED, SEALED AND DATED THIS_____DAY OF_____, 20_ .

_____
PRINCIPAL

Attest: BY_____(L.S.)

_____
Title of Officer

_____
SECRETARY (SEAL)

_____
Surety

Attest: BY_____(L.S.)

_____
Title of Officer

_____
SECRETARY (SEAL)

SECTION 00 1940 - CONTRACTOR QUALIFICATION STATEMENT

The Contractor Qualification Statement is the American Institute of Architect's Document A305 “Contractor Qualification Statement”, 2020 Edition, and is bound herewith.

Document A305 is enclosed (4 pages) following for each Prime Contractor’s review.

END OF SECTION 00 1940

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DRAFT

AIA® Document A305® – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)
« »

SUBMITTED TO:
(Organization name and address.)
«Upper Providence Township»«»
«935 N Providence Rd,
Media, PA 19063»

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)
« »

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

[«X»] Exhibit A – General Information
[«X»] Exhibit B – Financial and Performance Information
[«X»] Exhibit C – Project-Specific Information
[«X»] Exhibit D – Past Project Experience
[« »] Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

_____ « »
Organization's Authorized Representative Signature **Date**

« »
_____
Printed Name and Title

NOTARY
State of: « »
County of: « »
Signed and sworn to before me this « » day of « » « »

_____
Notary Signature

My commission expires: « »

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DRAFT AIA® Document A305™ – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

« »

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

« »

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

« »

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

« »

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

« »

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

« »

.2 If your organization is a partnership, identify its partners and its date of organization.

« »

.3 If your organization is individually owned, identify its owner and date of organization.

« »

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User Notes: (1463371110)

.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

« »

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

« »

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

« »

§ A.1.3.2 How many full-time employees work for your organization?

« »

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

« »

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

« »

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

« »

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

« »

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

« »

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

« »

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

« »

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§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

« »

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

« »

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

« »

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

« »

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

« »

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

« »

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

« »

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AIA® Document A305™ – 2020
Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

§ B.1 FINANCIAL
§ B.1.1 Federal tax identification number:

« »

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

« »

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

« »

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

« »

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS
§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

« »

§ B.2.2 In the last five years has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

« »

.2 been terminated for any reason except for an owners' convenience?

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User Notes: (1448040498)

« »

.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

« »

.4 filed any lawsuits or requested arbitration regarding a construction project?

« »

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

« »

.2 had any business or professional license subjected to disciplinary action?

« »

.3 been penalized or fined by a state or federal environmental agency?

« »

DRAFT

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AIA® Document A305™ – 2020
Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by « » and dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

« »
« »

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

« »

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

« »

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

« »

§ C.1 PERFORMANCE OF THE WORK
§ C.1.1 When was the Contractor's Project Office established?

« »

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

« »

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

« »

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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« »

§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

« »

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

« »

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

« »

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

« »

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

« »

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

« »

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

« »

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

« »

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

§ C.4.2 If requested, will your organization be able to provide property insurance for the Project written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis?

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« »

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.2? If so, identify.

« »

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

« »

§ C.5.2 Surety company name:

« »

§ C.5.3 Surety agent name and contact information:

« »

§ C.5.4 Total bonding capacity:

« »

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

« »

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AIA® Document A305™ – 2020
Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☑ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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AIA® Document A305™ – 2020
Exhibit E

Contractor's Past Project Experience, Continued

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☑ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

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SECTION 00 2625 - SUBSTITUTION REQUEST FORM

A. Submissions for approved substitutions will be permitted and processed in accord with Article 10 of Specification Section 001100 “Instructions to Bidders”.

B. Submissions will be "received dated" immediately upon arrival at the office of the Architect.

C. All Submissions must be received ten (10) days prior to bid or they may not be reviewed.

D. Reviewer's General Criteria for review will be:

1. Burden of proof of performance equality and completeness of this submittal is the responsibility of the submitter.
2. Reviewers will not be required to complete the submittal, that is, select from options or between models and lines of products.
3. Reviewer will not be required to seek information from the manufacturer's literature on file in the office, or information from other locations.
4. Product must be equal, or better, in those features and performance which specified product provides.
5. When in the reviewer's opinion, significant deficiencies are established, further review of submitted data is not required.

E. Reviewer will note action (approval or disapproval), the date, and their initials.

F. If a submittal is disapproved, reviewer will make notations that will be adequate to guide a later reviewer to the same conclusion. Sample notations may be: "Submittal vague", "incomplete", or "product equality not substantiated".

G. Submittals received after closing time will be "received dated," marked "late", initialed, and filed without review.

H. Submittals will be filed in the project file until completion of the project, then destroyed.

I. Approval of a substitute item will be communicated to bidders in the form of an Addendum.

TO:

MKSD, LLC
1209 Hausman Road, Suite A
Allentown, PA 18104

PROJECT _____

PRIME BIDDER _____

CONTRACTOR/SUPPLIER _____

We hereby submit for consideration, the following product instead of specified item for above project:

SECTION/DRAWING	**PARAGRAPH/DETAIL**	**SPECIFIED ITEM**
_____	_____	_____

Proposed Substitution: _____

MANUFACTURER'S HOME OFFICE:	LOCAL REPRESENTATIVE:
Address: _____	Address: _____
Telephone: _____	Telephone: _____
Contact: _____	Contact: _____

Attached to this request is product data, specifications, performance tests and data, and color samples. The attached information also includes any modifications of the Contract Documents which would be required if this substitution is utilized for this Project.

The undersigned states that as a Prime Bidder on the above referenced Project the following statements are true.

1. The Prime Bidder has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. That the product manufacturer will provide the same warranty for the Substitution as for the specified Product.
3. That the use of this product will not have an adverse effect on any other trade or Prime Contractor or the Construction Schedule.
4. That the use of this product does not affect the dimensions shown on the Drawings unless specifically stated in the attached information.

Reason for Substitution:

_____

_____

_____

ATTACHMENTS *(If not applicable, write N/A in space provided)*

No. 1 Complete product data, including technical data and laboratory tests, if applicable.

_____

No. 2 Drawings indicating dimensional changes. _____

No. 3 Complete description of changes to drawings and specifications which proposed substitution will require for its proper installation.

_____

No. 4 Necessary samples and substantiating data to prove equal quality, performance, and appearance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance. Differences in quality of materials and construction shall be indicated.

No. 5 List of names and addresses of three similar projects on which product was used, date of installation, and Architect/Engineer's name, address, and telephone numbers.

_____

_____

_____

Fill in blanks below *(Provide attachments if more space is necessary)*

A. Does the substitution affect dimensions indicated on the Contract Drawings?

Yes _____ No _____ If yes, clearly indicate changes:

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

_____

_____

C. What effect does substitution have on other trades, other contracts, and Contract Completion Date?

_____

D. What effect does substitution have on applicable code requirements?

_____

E. List differences between proposed substitution and specified item:

F. Identify manufacturer's guarantees: _____

G. Identify cost impact; Provide attachments showing proposed credit:

Undersigned attests function and quality equivalent or superior to specified item.

CERTIFICATION OF EQUAL PERFORMANCE:

Submitted by: _____ Title: _____

Company: _____

Address: _____

Date: _____

Telephone: _____ E-mail: _____

Signature: _____

. . . . . .

For Use by the Architect/Engineer:

Accepted: _____ Accepted as Noted: _____

Not Accepted: _____ Received Too Late: _____

Reviewer: _____ Date: _____

REMARKS: _____

_____

_____

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IN THE COURT OF COMMON PLEAS
OF DELAWARE COUNTY, PENNSYLVANIA

CONTRACTOR: _____

NO. _____

AND
Upper Providence Township

NO-LIEN AGREEMENT

WHEREAS, the parties hereto did on the _____ day of _____, 2025, enter into an agreement (hereinafter the "Contract"), therein and whereby said Contractor undertook and agreed to furnish all materials, labor and equipment, etc., to complete the work for the Upper Providence Township Municipal Complex Renovations & Addition, located at 935 N Providence Rd, Media, PA 19063.

NOW, THEREFORE, the Contractor for itself and any and all subcontractors, materialmen and parties acting for, through or under the Contractor or for, through or under any of them, does covenant and agree that it will not at any time suffer or permit any mechanics' lien or any other lien, attachment or other encumbrance, under any laws, regulations, or orders, Federal, State or local, or otherwise by any person or persons whomsoever, to be put or remain on the building or premises, into or upon which any work is done or labor or materials are furnished under this Contract, for such work, labor or material, or by reason of any other claim or demand against the Contractor, and the Contractor has not obtained absolute title; and the Contractor agrees, further, that any mechanics' lien, materialmen's lien or any other lien, attachment or other encumbrance or claim of a third party, however arising (whether through the Contractor's or Owner's or any other persons action or inaction, and whether valid or invalid), until it is removed shall preclude any and all claim or demand for any payment whatsoever under or by virtue of the Contract, and in the event that same is not removed, the Owner at its discretion may remove same at the expense (including legal fees) of the Contractor, and without regard to the validity or invalidity thereof.

The Contractor expressly agrees further, that no lien shall attach to the real estate, building, structures, or any other improvement to the Owner either on behalf of the Contractor herein or on behalf of any subcontractor, mechanic, journeyman, laborer, materialman or person performing improvement or premises of said Owner, or on behalf of any other person. Neither the Contractor nor any other person supplying any materials, equipment, machinery or other property, or performing work or labor in or upon the building or the work, included in this Contract shall have the right to file a mechanic's lien against the building or premises.

Contractor warrants and represents that at the time of execution hereof no work of any kind has been done and no materials of any kind have been furnished, delivered or ordered in connection with the performance of this Contract of any supplemental contract for extra work.

This stipulation and waiver is made and intended to be filed with the Delaware County Prothonotary within ten (10) days after the date hereof, in accordance with the requirements of Act of Assembly of Pennsylvania, in such case provided.

In WITNESS WHEREOF, we have hereunto set our hands and seals, intending thereby to become legally bound this _____ day of _____, 20____.

OWNER:
Upper Providence Township

_____

_____

_____

ATTEST: _____

_____

WITNESS: _____

CONTRACTOR:

By:

SECTION 00 7000 - CONTRACT FOR CONSTRUCTION FORM OF AGREEMENT

The Standard Form of Agreement for this Contract is the American Institute of Architect's Document A132 “Standard Form of Agreement Between Owner and Contractor, Construction Manager as Advisor Edition”, 2019 Edition, is bound herewith.

The Contract shall be in effect for the duration of this project for all Contractors.

Document A132 is enclosed for each Prime Contractor’s review.

END OF SECTION 00 7000

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AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor,
Construction Manager as Adviser Edition

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

«Upper Providence Township»«»
«935 N Providence Rd, Media, PA 19063»

and the Contractor:
(Name, legal status, address, and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location, and detailed description)

«Upper Providence Township Municipal Complex Renovations & Addition»
«935 N Providence Rd, Media, PA 19063»

The Construction Manager:
(Name, legal status, address, and other information)

«New Road Construction Management
1876 Greentree Road
Cherry Hill, New Jersey 08003»

The Architect:
(Name, legal status, address, and other information)

«MKSD, LLC »« »
«1209 Hausman Road, Suite A »
«Allentown, PA 18104 »
«610-366-2081 »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS
EXHIBIT B DETERMINATION OF THE COST OF THE WORK

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9. To the extent of any direct conflict or inconsistency between any of the Contract Documents, the Contractor shall immediately seek clarification from the Construction Manager. In the event that the Construction Manager fails to clarify such discrepancy, within a reasonable time under the circumstances, the Contractor shall proceed with the Work and give precedence to the Contract Documents in the following order of priority: (1) modifications issued after execution of the Agreement; (2) the Agreement; (3) Addenda issued prior to the execution of the Agreement, with the Addenda bearing the latest date taking precedence; (4) any supplementary conditions; (5) the General Conditions of the Contract for Construction; and (6) the Final Drawings and Specifications. The Contract Documents do not include soundings, dug test pits, and/or auger or test borings reports or other information contained in geotechnical reports or similar documents.

ARTICLE 2 THE WORK OF THIS CONTRACT

§ 2.1 The Contractor shall fully execute the Work described in the Contract Documents as well as all attachments thereto and all work reasonably inferable by the Contract Documents as necessary to produce the results intended by the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others. A list of Contract Documents is attached hereto and incorporated herein as part of Exhibit "___."

§ 2.2 The Contractor shall furnish only skill and properly trained staff for the performance of the Work. The key members of the Contractor's staff shall be persons agreed upon by the Owner and identified in writing prior to the start of the Work. The Owner's authorized representative is set forth in section 14.3 below.

§ 2.2.1 Such key members of the Contractor's staff shall not be changed without the written consent of the Owner, unless such person becomes unable to perform any required duties due to death, disability, transfer, or termination of employment with the Contractor. If a key member is no longer capable of performing, the Owner and the Contractor shall agree on a mutually acceptable substitute.

§ 2.2.2 During the performance of the Work, the Contractor shall keep competent key personnel, including, but not limited to, Project Manager, Project Engineer, and Superintendent, at the Project site, fully authorized to act on behalf of

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the Contractor. Notice from the Owner and/or Construction Manager to such key personnel shall be considered notice to the Contractor.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« X »] A date set forth in a written notice to proceed issued by the Owner to the Contractor, or upon the receipt of the Building Permit, whichever is later.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

« »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

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ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[« »] Stipulated Sum, in accordance with Section 4.2 below

[« »] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[« »] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

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« »

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price
§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.4.6 *Unit Prices, if any: (Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)*

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price
§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed « » ($ « »), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates
§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

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§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

« »

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

« The Contractor acknowledges and recognizes that the Owner is entitled to full and beneficial use of the completed work following expiration of the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to achieve Substantial Completion of the entire Work within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be extremely difficult to ascertain. Therefore, the Owner and Contractor agree as set forth in this section.

« If the Contractor fails to achieve Substantial Completion as set forth in Section 3.3.1 of this Agreement, as may be adjusted pursuant to the Contract Documents, the Owner shall be entitled to assess liquidated damages against the Contractor in the amount of $_____ for each and every day thereafter until Substantial Completion is achieved.

The liquidated damages assessed by Owner against Contractor shall be Owner's sole monetary remedy against Contractor for Contractor's delay and failure to attain Substantial Completion of the Work by the date set forth in Section 3.3.1, as may be adjusted pursuant to the Contract Document; provided, however, that nothing herein shall limit Owner's rights to suspend or terminate the Work or Contractor, nor any of Owner's other non-monetary rights set forth herein. The Owner and Contractor agree that actual damages incurred by the Owner as a result of the delay are difficult to calculate with specificity and that the foregoing Liquidated Damages represent a mutual good faith estimate of what the parties believe to be the amount of actual damages to be incurred by the Owner on account of the delay. The parties jointly agree and stipulate that the contractually agreed to liquidated damages set forth above are not a penalty.
»

§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents. In addition to the other required items, each application for payment shall be accomplished by the following, all in form and substance satisfactory to the Owner and in compliance with applicable statutes of the jurisdiction in which the Project is located:

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.1 A current sworn statement from the Contractor setting forth all Subcontractors and any material suppliers with whom Contractor has subcontracted, the amount requested for any Subcontractor or material supplier in the Application for Payment and the amount to be paid to the Contractor from such progress payment, as well as a sworn statement from the Contractor establishing receipt of payment or satisfaction of the payment requested by the Contractor in the previous Application for Payment, if any;

.2 Duly executed releases of mechanics' and material suppliers' liens and claims from the Contractor and also Subcontractors, sub-subcontractors and suppliers establishing payment or satisfaction of the payment requested by the Contractor in the previous Application for Payment (See Exhibit "___"); and

.3 Such other information, documentation, and materials, as the Owner, Owner's Lender, or the title insurer may reasonably require.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« On or before the 20th day of the month immediately preceding a month in which the Contractor will submit an Application for Payment, the Owner, the Architect, the Construction Manager and the Contractor shall meet to review a preliminary draft of such Application for Payment (hereinafter referred to as a "Pencil Draw") prepared by the Contractor. The Contractor shall revise the Pencil Draw in accordance with any objection or recommendation of the Owner, Construction Manager or the Architect. Such revised Pencil Draw shall be resubmitted by the Contractor to the Construction Manager as the Application for Payment due on the fifth (5th) day of the month immediately following the month in which the Pencil Draw was first amended. The Contractor shall also submit with each Application for Payment a written narrative describing the basis for any items set forth in the Application for Payment that does not conform to the instructions of the Owner, Construction Manager or the Architect in connection with any applicable Pencil Draw. »

§ 5.1.3 Provided that a "Pencil Draw" Application for Payment pursuant to Section 5.1.2 is received by the Construction Manager not later than the «20th » day of a month and the Application for Payment submitted by the fifth (5th) day of the following month as stated above, , the Owner shall make payment of the amount certified to the Contractor not later than the «last » day of the «same » month in which the Application for Payment is submitted. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than «thirty » («30 ») days after the Construction Manager receives the Application for Payment. Contractor is only permitted to submit one Application for Payment per calendar month.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner and Owner's Lender, if any, suitably stored off the site at a location agreed upon in writing; and

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.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;

.2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall

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not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values, unless objected to by the Owner, Architect, or Construction Manager shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

- **.1** That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;
- **.2** That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner and Owner's Lender, if any, suitably stored off the site at a location agreed upon in writing;
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

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.4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval and the prior written approval of Owner's Lender, if any, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

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« If the Owner reduces the retainage requirements of this Agreement or releases any portion of retainage prior to the date specified in the Contract Documents, any such reduction or release of retainage, or portion thereof, shall not be a waiver of any of the Owner's rights to retainage in connection with other payments to the Contractor or any other right or remedy that the Owner has under the Contract Documents, at law or in equity. Furthermore, the Owner reserves the right to withhold retainage due to the existence of unresolved claims from the Contractor's Subcontractors, Suppliers or any lower tier sub-subcontractors or suppliers to the extent necessary to reasonably protect the Owner as determined in Owner's sole discretion. The retainage of trades that complete their work prior to Final Completion of the Project, such as, but not limited to, steel, concrete, caissons, curtain wall, earthwork, aluminum, glass, glazing, exterior panels, plank, etc. ("Early Trades") may be released in Owner's sole discretion upon final completion of all the Early Trade's work on the Project including any punch-list items. »

»

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

« »

§ 5.2 Final Payment
§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum
§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted all necessary documentation required by the Contract Documents, as well as any reasonable requests for additional documentation made by the Owner or the Construction Lender, if any;

.3 the Contractor has submitted duly executed releases of mechanics' and material suppliers' liens and claims from the Contractor and also Subcontractors, sub-subcontractors and suppliers; and

.4 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« Furthermore, the Owner reserves the right to withhold Final Payment due to the existence of unresolved claims from the Contractor's Subcontractors, Suppliers or any lower tier sub-subcontractors or suppliers to the extent necessary to reasonably protect the Owner as determined in Owner's sole discretion. »

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price
§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment;

.3 the Contractor has submitted all necessary documentation required by the Contract Documents, as well as any reasonable requests for additional documentation made by the Owner or the Construction Lender, if any;

.4 the Contractor has submitted duly executed releases of mechanics' and material suppliers' liens and claims from the Contractor and also Subcontractors, sub-subcontractors and suppliers

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.5 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« Furthermore, the Owner reserves the right to withhold Final Payment due to the existence of unresolved claims from the Contractor's Subcontractors, Suppliers or any lower tier sub-subcontractors or suppliers to the extent necessary to reasonably protect the Owner as determined in Owner's sole discretion. »

§ 5.3 Intentionally omitted.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[« »] Litigation in a court of competent jurisdiction.

[«X »] Other: *(Specify)*

« See A201 as modified »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

«None »

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

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§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

«None »

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

« »
« »
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§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

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« »
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« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Relationship of the Parties
Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

««**§ 8.8.1** The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents), as a material inducement to the Owner to execute this Agreement, which representations and warranties shall survive the execution and delivery of this Agreement, any termination of this Agreement, and the final completion of the Work:

.1 The Contractor is financially solvent, is able to pay all debts as they mature, and is possessed of sufficient working capital to complete the Work and perform all obligations hereunder;
.2 The Contractor is able to furnish the plant, tools, materials, supplies, equipment and the labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;
.3 The Contractor is authorized to do business in the state in which the Project is located and is properly licensed by all necessary governmental and public and qualified public authorities having jurisdiction over the Contractor and over the Work and the Project;
.4 The Contractor's execution of this Agreement and performance thereof is within the Contractor's duly authorized powers;

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.5 The Contractor's duly authorized representative has visited the site of the Project, is familiar with the location conditions under which the Work is to be performed, and has correlated observations with the requirements of the Contract Documents; and

.6 The Contractor possesses a high level of experience and expertise in the business administration, construction, construction management, and superintendence on Projects of this size, complexity, and the nature of this particular Project and will perform the Work with the care, skill, and diligence of such a contractor.

§ 8.8.2 Employee Verification through E-Verify.
Contractor and its Subcontractors shall comply with the Construction Industry Employee Verification Act ("Act 75"). In accordance with Act 75, each "construction industry employer" who hires an employee on or after October 7, 2020 shall verify the employment eligibility of the employee through the E-Verify program operated by the Department of Homeland Security and shall keep a record of the verification for the duration of the employee's employment or three years, whichever is longer.

§ 8.8.3 The Contractor acknowledges that the Owner maybe financing the Work with a loan from the Lender. In order to perform under the Contract Documents, the Owner must comply with certain terms and conditions embodied in the Lender's construction loan agreement. The Contractor agrees to use its best efforts to comply with the requirements of the Lender that bear upon the performance of the Work. The Contractor shall also:

1. Make the site of the Work available at reasonable times for inspection by the Lender or the Lender's representatives;

2. Consent to execute all documents reasonably requested by the Owner in connection with the assignment of this Agreement and the Drawings and Specifications to the Lender for collateral purposes. Such assignment shall provide that the Contractor agrees that notwithstanding a default by the Owner under the provisions of this Agreement that would give the Contractor the right to terminate this Agreement, the Contractor will continue to perform its obligations hereunder (on the same terms and conditions as are set forth herein) for and on account of the Lender, if the Lender, in its sole discretion, decided to proceed with the Project; and

3. Promptly furnish the Owner with information, documents, and material that the Owner may reasonably request from time to time in order to comply with the requirements of the Lender.

§ 8.8.4 Notwithstanding anything to the contrary contained in this Agreement or in any of the other Contract Documents, neither the Owner, any partner of the Owner, nor any person or entity holding any interest in the Owner shall be personally liable, whether directly or indirectly, by reason of any default by the Owner in the performance of any of the obligations of the Owner under this Agreement, including, without limitation, the Owner's failure to pay the Contractor as required hereunder, and in the event of any such default, the Contractor hereby agrees to look solely to the Owner's interest in the property upon which the Project is situated to secure the performance in payment of all such obligations. From time to time, however, the Owner may elect to sell, lease, mortgage, or otherwise transfer any of the Owner's interest in any portion of the Project site, not including any part of the Project site covered by the Project itself ("Site Conveyance"). In connection with any Site Conveyance, the Contractor shall execute and deliver to the Owner and shall cause any Subcontractors to execute and deliver to the Owner such documents for the benefit of the Owner, any purchaser, and any title insurance company issuing title insurance a full and complete release of all mechanics' and materials suppliers' liens and rights, with respect to the property that is the subject of such Site Conveyance, together with such other documents as a title company may require to induce it to issue its policy of title insurance with respect to the Site Conveyance without requiring the Owner's indemnity against mechanics' and materials suppliers' liens. »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, as modified

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

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.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[« »] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

«List of Contract Documents – Exhibit ___
Partial and Final Lien Waiver Forms- Exhibit ___ »

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*

CONTRACTOR *(Signature)*

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« »« »

(Printed name and title)

« »« »

(Printed name and title)

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AIA® Document A132® – 2019 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month, and year.)

for the following **PROJECT**:
(Name and location or address)

«Upper Providence Township Municipal Complex Renovations & Addition»
«935 N Providence Rd, Media, PA 19063»

THE OWNER:
(Name, legal status, and address)

«Upper Providence Township»«»
«935 N Providence Rd, Media, PA 19063»

THE CONTRACTOR:
(Name, legal status, and address)

« »« »
« »

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A232™–2019, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A232™–2019, General Conditions of the Contract for Construction. Article 11 of A232™–2019 contains additional insurance provisions

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to false work and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's, Construction Manager's, and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

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(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.

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(Indicate applicable limits of coverage or other conditions in the fill point below.)

« »

[« »] **§ A.2.5.2 Other Insurance**

(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») each occurrence, «Two Million Dollars » ($ «2,000,000 ») general aggregate, and «Two Million Dollars » ($ «2,000,000 ») aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

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§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- **.1** Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- **.2** Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- **.3** Claims for bodily injury other than to employees of the insured.
- **.4** Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- **.5** Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- **.6** Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- **.7** Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- **.8** Claims related to roofing, if the Work involves roofing.
- **.9** Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- **.10** Claims related to earth subsidence or movement, where the Work involves such hazards.
- **.11** Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than «One Hundred Thousand Dollars » ($ «100,000 ») each accident, «One Hundred Thousand Dollars » ($ «100,000 ») each employee, and «Five Hundred Thousand Dollars » ($ «500,000 ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per claim and «Two Million Dollars » ($ «2,000,000 ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « One Million Dollars » ($ « 1,000,000 ») per claim and « Two Million Dollars » ($ «2,000,000 ») in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

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§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

«Umbrella Liability or Excess Liability – Two Million Dollars ($2,000,000.00) each occurrence. Two Million Dollars ($2,000,000.00) general aggregate. Two Million Dollars ($2,000,000.00) Products and Completed Operations Aggregate. Two Million Dollars ($2,000,000.00) - Personal and Advertising Injury »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] **§ A.3.3.2.1** If there is only one Contractor performing the Work on the Project, property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[« »] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

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[« »] **§ A.3.3.2.6 Other Insurance**

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	«100% »
Performance Bond	«100% »

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

«Maintenance Bond in the amount of 15% for 18 Months »

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SECTION 00 7226- GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The General Conditions of this Contract is the American Institute of Architect's Document A232 “General Conditions of the Contract for Construction, Construction Manager as Advisor Edition”, 2019 Edition, is bound herewith.

The General Conditions shall be in effect for the duration of this project for all

Contractors. Document A232 is enclosed for each Prime Contractor’s review.

END OF SECTION 00 7226

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AIA® Document A232™ – 2019

General Conditions of the Contract for Construction,
Construction Manager as Adviser Edition

for the following PROJECT:
(Name, and location or address)

«Upper Providence Township Municipal Complex Renovations & Addition»
«935 N Providence Rd, Media, PA 19063»

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

«New Road Construction Management
1876 Greentree Road
Cherry Hill, New Jersey 08003»

THE OWNER:
(Name, legal status, and address)

«Upper Providence Township»«»
«935 N Providence Rd, Media, PA 19063»

THE ARCHITECT:
(Name, legal status, and address)

« MKSD, LLC »
«1209 Hausman Rd, Suite A »
«Allentown, PA 18104»
«Telephone: 610-366-2081

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents consist of the Agreement, the General Conditions of the Contract for Construction, Drawings, Specifications, Advertisement for Bids, Instructions to Bidders, Addenda issued prior to execution of the Contract, other documents listed in the Agreement such as the Contractor's executed Bid Form, Bid Bond, Agreement of Surety, Performance Bond, Payment Bond, and Non-Collusion Affidavit, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. The Contract Documents also include, but are not limited to, sample forms and other information furnished by the Owner in anticipation of receiving bids, quotes, or proposals. The Contract Documents shall apply to all Prime Contractors and each Prime Contractor shall be responsible for the content of them all.

§ 1.1.1.1 The Contractor is responsible to read the entire AIA A232-2019 General Conditions of the Contract for Construction as it has been modified from the original AIA Document A232-2019.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) except as provided in Article 6 of these General Conditions, between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.2.1 Contractor acknowledges and warrants that it has closely examined all of the Contract Documents, that they are suitable and sufficient to enable the Contractor to complete the Work in a timely manner for the Contract Sum, and that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable standards, codes, laws, ordinances, regulations and/or requirements of any local, state, federal or other governmental agency.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations, and further including all labor, materials, equipment and services provided by any Subcontractor and Sub-subcontractor Work, material suppliers, and/or any other entity from whom the Contractor is responsible whether on or off the site of the Project. The Work may constitute the whole or a part of the Project.

§ 1.1.3.1 The Work shall include, without limitation, the obligation of the Contractor to visit the Project site before submitting a Bid. Such site visit shall be for the purpose of familiarizing the Contractor with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, including, without limitation, all existing site conditions, access to the site, and the physical characteristics of the site and surrounding areas.

§ 1.1.3.2 Nothing in these General Conditions shall be interpreted as imposing on either the Owner, Construction Manager or Architect, or their respective agents, employees, officers, directors or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed Project, or that do not comprise the Work, including, but not limited to, the following: shoring; scaffolding; hoists; weatherproofing; or any temporary facility; or activity; since these are the sole responsibility of the Contractor.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

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§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager. This includes all Prime Contractors who have mutual responsibility to each other.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.7.1 The Drawings are diagrammatical and show the general arrangement and extent of the Work; exact locations and arrangements of parts shall be determined as the Work progresses and shall be subject to the Architect's approval. No extra compensation will be allowed due to conflicts, inconsistencies, or discrepancies between actual dimensions and those indicated. The right is reserved by the Architect to make any reasonable change in location of equipment, ductwork and piping prior to roughing in without involving additional compensation to the Prime Contractors. Each Prime Contractor shall coordinate its Work with the Work of others, so that interference between trades does not occur. Each Prime Contractor shall furnish and install offsets, bends, turns, and the like in connection with its Work to avoid interference with Work of other Contractors, to conceal Work where required, and to secure necessary clearance and access for operation and maintenance.

§ 1.1.7.2 Contractor shall carefully examine the Architectural, Mechanical, Plumbing, Electrical, and other Contract Drawings and Specifications. If any discrepancies occur between the Drawings or between the Drawings and Specifications, the Contractor shall report such discrepancies to the Architect and Construction Manager in writing and obtain written instructions as to the manner in which to proceed. No departures from the Contract Documents shall be made without prior written approval of the Architect and Construction Manager.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.1.11 Completion Date: The term Completion Date means any Substantial Completion, final completion, milestone, phase, or other time sensitive date identified in the Contract Documents.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, and ordinances, the Contractor shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation. The terms and conditions of this Sub-section 1.2.1, however, shall not relieve the Contractor of any of the obligations set forth in Sub-sections 3.2 and 3.7. Moreover, Work not expressly required in the Contract Documents will be required if it is consistent with the Contract Documents, is reasonably inferable from them as

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being necessary to produce the indicated results, is required by Article 2 of the Agreement, and to the extent it is necessary to produce complete and functioning Work.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 Notwithstanding anything else to the contrary in the Contract Documents, in the event of conflicts, inconsistencies or discrepancies between and/or within the Contract Documents and/or applicable standards, codes, laws, ordinances, regulations and/or requirements of any state, federal or any other governmental agency, the Contractor shall (1) provide the better quality or greater quantity of Work or (2) comply with the more stringent requirement, or both, in accordance with the Architect's interpretation. The terms and conditions of this Section 1.2.1.2, however, shall not relieve the Contractor of any of the obligations set forth in Sections 3.2 and 3.7.

§ 1.2.1.3 In the event of conflicts, inconsistencies, or discrepancies between and/or within the Contract Documents, interpretations will be based on the following order of precedence:

.1 The Agreement
.2 Addenda, those of later date have precedence
.3 General Conditions of the Contract for Construction
.4 Specifications
.5 Large-scale Drawings shall supersede smaller-scale Drawings
.6 Figural dimensions shall govern over scaling of the Drawings
.7 Explanatory notes shall take precedence over conflicting drawn note indications.
.8 In case of conflicts, inconsistencies, or discrepancies in the Drawings or in the Specifications, the latter shall be submitted to the Architect who will promptly provide a determination in writing. In the case of a conflict, inconsistency, or discrepancy between and/or within the Drawings and Specifications not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation, and no additional compensation or extension of time will be allowed.

§ 1.2.1.4 If a minor change in the Work is found necessary due to actual field conditions, each Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. The Contractor represents that the Subcontractors, manufacturers, and suppliers engaged or to be engaged by it are and will be familiar with the requirements for performance by them. Instructions and other information furnished in the Specifications, including, without limitation, items in connection with prefabricated or pre-finished items, are not intended to supersede work agreements between employers and employees. Should the Specifications conflict with such work agreements, the work agreements shall be followed, provided such items are provided and finished as specified. If necessary, such Work shall be performed on the Project site, instead of at the shop, by appropriate labor and in accordance with the requirements of the Drawings and Specifications.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Where the Work is shown in complete detail on only a portion of the Drawings or there is an indication of continuation, the remainder being shown in outline, the Work drawn out in detail shall be understood to apply to the other portions of the structure. The Drawings and Specifications are intended to be a common and complimentary set of documents. Anything shown on the Drawings but not in Specifications shall be equally binding as if both noted on the Drawings and called for in the Specifications.

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§ 1.2.5 No measurement of a drawing by scale shall be used as working dimension. Working measurements shall be taken from figure dimensions. Work shown diagrammatically on Drawings shall be agreed upon for exact location before being installed. Where the activities of two or more trades are in close proximity, the Contractor shall confer with the other Prime Contractor(s) concerned before making its installation. Work installed by the Contractor in an arbitrary manner without regard for the work of other Separate Contractors or Prime Contractors shall be promptly repaired and/or replaced by the Contractor to the satisfaction of the Architect at no additional cost to the Owner.

§ 1.2.6 The Contractor shall carefully examine the civil, architectural, plumbing, electrical, fire protection and other Drawings and Specifications. If any conflicts, inconsistencies, or discrepancies occur between and/or within the Drawings and Specifications and is discovered after the submission of bids, the Contractor shall promptly report such a conflict, inconsistency, or discrepancy to the Architect in writing and obtain written instructions as to the manner in which to proceed. No departures from the Contract Documents shall be made without the prior written approval of the Architect and written notice to the Owner.

§ 1.2.7 The Drawings and Specifications, as a part of the Contract Documents, are for the purpose of illustrating and describing the general character and extent of the Work; and they are intended to agree and be mutually explanatory. Further, it is the intention that these instruments of service shall be complete in their meaning and shall represent completeness in design as well as any fragments thereof. It is the intent and purpose of the Specifications and Drawings to cover and include each item of material, machinery, apparatus, equipment, labor, and services necessary to properly install, equip, adjust, and put into full operation the respective portions of the installations specified, and to so interconnect the various items or sections of the Work as to form a complete and operating whole, and deliver the Work in the specified time. Any apparatus, machinery, material, equipment, labor, and services not specifically mentioned which may be found necessary to complete or perfect any portion of the Work in a substantial manner, and in compliance with the requirements stated, implied, or intended in the Contract Documents, shall be furnished without extra cost to the Owner. This shall include all material, devices, or methods peculiar to the type of construction furnished and installed by the Contractor.

§ 1.2.8 If the Contractor, in the course of the Work, finds any discrepancy between the Drawings and the physical conditions of the locality, or any errors in Drawings or in the layout as given by the points and instruction, the Contractor shall immediately inform the Construction Manager and Architect in writing and the Construction Manager and Architect, with reasonable promptness, shall verify the same. Any work done after such discovery, until authorized, shall be done at the Contractor's risk.

§ 1.2.9 Where the Contract Documents duplicate the same work or materials under more than one Prime Contract or subcontract, such duplication shall be settled by the Construction Manager and Architect in writing upon request of a Prime Contractor concerned prior to submission of Bid. Any such duplication which may exist in the Contract Documents after Bids are received will be interpreted by the Construction Manager and Architect as having duplicate values in the multiple contracts or subcontracts and proper credit to the Owner, therefore, shall be made by the Contractors as the Architect shall designate.

§ 1.2.10 Division 01 shall govern the execution of all Specification Sections.

§ 1.2.11 Whenever a product is specified or shown by describing propriety items, model numbers, catalog numbers, manufacturer, trade names, or similar reference, no substitutions may be made unless accepted prior to execution of the Contract or if accepted as a Change in the Work. Where two or more products are shown or specified, the Contractor has the option to use either of those shown or specified.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

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§ 1.4 Interpretation

§ 1.4.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement. Unless otherwise indicated, any reference to a Section means the Section of these General Conditions, including any subsections thereof.

§ 1.4.2 Unless otherwise defined herein or elsewhere in the Contract Documents, for the purpose of the Contract Documents, the meaning of all words, shall be in accordance with the definitions given in the latest edition of "The Random House Dictionary of the English Language." Certain terms used in the Contract Documents are defined in this Article. Definitions and explanations of this Article are not necessarily either complete or exclusive but are general for the Work to the extent they are not stated more explicitly in other provisions of the Contract Documents. These terms are:

.1 Indicated: The term "indicated" is a cross-reference to graphics, notes, or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping the reader locate a cross-reference, and no limitation of location is intended except as specifically noted.

.2 Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted" and "permitted" mean "directed by the Architect, after consultation with the Owner." However, no such implied meaning will be interpreted to extend the Architect's or Construction Manager's responsibility into Contractor's area of construction supervision.

.3 Approved: Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by a Contractor, the term "approved" will be held to limit the Architect's responsibilities and duties as specified in these General Conditions. In no case will "approved" by the Architect or Construction Manager be interpreted as a release of Contractor from responsibilities to fulfill requirements of Contract Documents.

.4 Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations, as applicable in each instance.

.5 Install: Except as otherwise defined in greater detail, the term "install" is used to describe operations at the Project site including, but not limited to, unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protection, cleaning, and similar operations, including, without limitation, the coordination with other Prime Contractors and Subcontractors as applicable in each instance.

.6 Relocate: The term "relocate" shall mean "move from the existing location to the new location installed complete and ready for use" for all items noted on the Drawings and/or indicated in the Specifications.

.7 Provide: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

.8 Coordinate: The term "coordinate" means to cooperate with related trades to furnish and install all connections between the trades in correct sequence, size, and location to create a complete system ready for the intended use.

.9 Verify: The term "verify" means to measure, investigate, review, test, and check the accuracy or correctness of and prove by demonstration, evidence, or testimony, the location, size, dimension, and condition of an item.

.10 Laws or Regulations: The terms "laws" and "regulations" each include, without limitation, laws, statutes, ordinances, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work, whether they are lawfully imposed by authorities having jurisdiction or not.

.11 Typographical and spelling errors shall be interpreted by the Architect for their obvious meaning and intent. References throughout the Contract Documents expressed in the singular number shall mean one or more like items as may be required to complete the Work. Likewise, plural references that obviously imply only one item shall mean only one item.

.12 Contract Description: The term "Contract Description" means a list of Specification Sections, narrative, and Contract Document references that will be the responsibility of the Contractor.

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.13 "Agreement" and "Contract" may be used interchangeably.

.14 The terms "project schedule," "construction schedule," or "schedule" shall be used interchangeably to mean the schedule of activities with dates and duration for each activity of work required for the project.

.15 The term "reasonably inferable" includes work necessary to "provide" work indicated or specified, as defined in section: Definitions and Standards; that is: furnish and install, complete, in place and ready for use.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 Except as otherwise agreed to between Owner and Architect, the Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights thereto.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants, as applicable.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.6.3 Written Notice

Where written notice is expressly required under the Contract Documents, written notice shall be deemed to have been duly served if delivered by email to the party's representative identified in the Contract Documents, registered or certified mail, or by courier service providing proof of delivery to party's respective address identified in the Agreement. Notwithstanding the foregoing, written notice regarding Claims must be transmitted by express, overnight mail, or courier service, each with proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit G202™–2013, Project Building Information Modeling Protocol Form, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.7.1 The Architect may, with the concurrence of the Owner, furnish to the Contractors versions of Instruments of Service in electronic form. The Contractor shall not transfer or reuse Instruments of Service in electronic or machine-readable form without the prior written consent of the Architect.

§ 1.7.2 Should the Contractor request and receive project information in an electronic format for its use in the execution of its Work, it is understood the electronic files provided are for informational purposes only and do not necessarily represent a final and/or complete design of the Project and its systems. Contractor shall not be entitled to rely on the accuracy of the information provided and instead, shall verify all information and actual Project conditions. Neither the Owner, Construction Manager nor Architect shall be responsible for the information contained on the electronic

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files or subsequent use thereof. Owner, Construction Manager, and Architect caution any user of the electronic files that subsequent changes may have been made to the Project and/or Contract Documents which are not reflected on the electronic files. Only final stamped drawings represent an accurate record of the Architect's design.

§ 1.7.3 The Contractor agrees to indemnify and hold harmless the Owner, Construction Manager, Architect, and their respective officers, directors, representatives, insurers, agents, employees and assigns from any and all claims, actions, damages, losses, and costs arising out of or related to the Contractor's request for and use of the electronic files, including, but not limited to any errors, omissions, anomalies, or variances contained therein.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in writing shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. The Owner is a Pennsylvania Public School District; therefore, the Owner's liability under the Contract cannot be increased without the affirmative vote of the Board of School Directors at a public meeting. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative. Notwithstanding the foregoing, the Construction Manager and Architect shall have the authority to act on behalf of the Owner with respect to providing notification, administering, or enforcing the Contract Documents.

§ 2.1.2 Intentionally deleted.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Intentionally deleted.

§ 2.2.2 Intentionally deleted.

§ 2.2.3 Intentionally deleted.

§ 2.2.4 Intentionally deleted.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, or as otherwise indicated in the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities, including zoning approvals, site development approvals, highway access approvals, design approvals, and other approvals related to permanent facilities and required precedent to application for permits for Work at the Project Site.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish surveys describing physical characteristics, easements, rights of way, and utility locations for the site of the Project and a legal description of the subject property. The furnishing of these surveys and the legal description of the site shall not relieve the Contractor from its duties under the Contract Documents. Neither Owner nor the Architect shall be required to furnish Contractor with any information concerning subsurface characteristics or conditions of the areas where the Work is to be performed. When the Owner or Architect has made investigations of subsurface characteristics or conditions of the areas where the Work is to be performed, such investigations, if any, were made solely for the purposes of Owner's study and Architect's design. Neither such investigations nor the records thereof are a part of the Contract between Owner and Contractor. To the extent such investigations or the records thereof are made available to Contractor by the Owner or Architect, such information is furnished solely for the convenience of Contractor and are not a part of the Contract Documents. Neither Owner nor Architect assumes any responsibility whatsoever in respect of the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Owner or Architect in its use thereof, and there is no warranty or guaranty, either express or implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout the areas where the Work is to be performed, or any part thereof, or that unforeseen developments may not occur, or that materials other than or in proportions different from those indicated may not be encountered. The Contractor shall undertake such further investigations and studies as may be necessary or useful to determine subsurface characteristics and conditions. In connection with the foregoing, Contractor shall be solely responsible for locating (and shall locate prior to performing any Work) all utility lines, telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, without limitation, all buried pipelines and buried telephone cables and shall perform the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. The Contractor represents that it is familiar with the Project site and has received all information it needs concerning the condition of the Project site. The Contractor represents that it has inspected the location of the Work and has satisfied itself as to the condition thereof, including, but not limited to, all structural, surface, and reasonably ascertainable subsurface conditions. Based upon the foregoing inspections, understandings, agreements and acknowledgments, the Contractor agrees and acknowledges: (1) that the Contract Sum is just and reasonable compensation for all Work, including, without limitation, foreseen and foreseeable risks, hazards and difficulties in connection therewith, and (2) that the Contract Time is adequate for the performance of the Work. The Contractor shall have no claims for surface or reasonably ascertainable subsurface conditions encountered. The Contractor shall exercise special care in executing subsurface Work in proximity of known subsurface utilities, improvements, and easements.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 The Contractor will be furnished, free of charge, one (1) hard copy and one (1) PDF set of Contract Documents including Drawings, Project Manuals, addenda, and modifications thereof, plus additional sets as required for permits. The Contractor shall pay the actual cost of reproduction for all additional sets or individual prints requested by him. Additional sets will be furnished at the cost of reproduction, postage, and handling.

§ 2.3.7.1 The Owner will provide for special testing and inspections not specifically indicated as by the Contractor in accordance with the requirements of Division 01 Section "Quality Requirements."

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. Other communication shall be made as set forth in Section 4.2.6.

§ 2.3.9 The Owner will furnish all land and rights-of-way necessary for the carrying out of the Agreement and the completion of the Work therein contemplated.

§ 2.3.10 To the extent required for the execution of the Work, the Contractor shall provide all temporary or permanent

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connections, terminations, removal, or alterations of the utility services to the site. Individual responsibilities of the separate Prime Contractors are delineated further in the Specifications.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2, fails to carry out Work in accordance with the Contract Documents, or disregards the instructions of Architect, Construction Manager, or Owner when based on the requirements of the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. Upon notice from the Owner, the Contractor shall resume performing such Work. This right shall be in addition to and not in restriction or derogation of the Owner's rights under Article 14 hereof. The Owner's right to stop the Work shall not relieve the Contractor of any of its responsibilities and obligations under or pursuant to the Contract Documents.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to adequately staff the Project with the proper management, supervision, materials and workforce, including its duty to proceed expeditiously with adequate forces so as to maintain the Project schedule, achieve the Project milestones, and Substantial Completion, and fails within a seven-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Notwithstanding the above, Owner shall not be required to comply with the notice provisions hereof and may proceed to correct such default and neglect if Contractor fails to, within a 24-hour period after receipt of written notice from the Owner, commence and continue correction of such default and neglect where further delay would cause disruption to the Project schedule. Owner shall have the further right to carry out work without any prior notice to Contractor, in an emergency affecting safety of persons or property, and said work is necessary to prevent threatened damage, injury or loss. The right of the Owner to carry out the Work pursuant to this Section 2.5 shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. The Owner's rights set forth in Sections 2.4 and 2.5 hereof shall be in addition to all other rights of the Owner granted in the Contract Documents, at law, or in equity. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including, but not limited to, Owner's expenses, attorneys' fees and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§ 2.6 Limitation of Responsibility

In no event shall the Owner, Construction Manager, and Architect have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents. Hence, the Owner and Contractor hereby acknowledge and agree that the Owner has retained the Contractor as an independent contractor to perform the Work on the Project. It is expressly understood and agreed that the presence on the jobsite of the Owner's visiting officers or employees, the Owner, Architect, Construction Manager, or supervisory personnel employed by Owner, and the making by such personnel of any inspections of the Contractor's Work, materials, tools or equipment, or of the finished Work of the Contractor and their approval of same, or failure to take exception thereto, shall in no way relieve the Contractor from its absolute responsibility to perform its Work and furnish its materials in accord with the requirements of the Contract Documents. Any failure by the Owner or Architect to take exception to any Work of the Contractor shall not constitute a ratification or approval of the Work or work methods employed by the Contractor if the same did not in fact comply with the requirements of the Contract Documents.

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ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required by applicable laws in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 Where term "Contractor" is modified in any way, such as, without limit, "this Contractor," "Plumbing Contractor," "HVAC Contractor" or "Mechanical Contractor," "General Contractor," "Electrical Contractor," the modified term shall be deemed to refer to that particular trade or Prime Contractor, but such meaning does not relieve the Contractor from its responsibility for all Work, whether or not such Work is sublet or subcontracted. The Contractor shall perform the Work in strict accordance with the Contract Documents. The plural term "Prime Contractors" or "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager and Architect. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor. The Contractor shall be responsible for the coordination of its Work with the other Prime Contractors. The Owner, Architect and its consultants, and the Construction Manager and its consultants, shall not be responsible for coordination or scheduling of the Contractor's Work.

§ 3.1.4 The General Contractor is designated as the Project Coordinator for this Project unless noted otherwise. See all of Articles 3 and 6 for additional information.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has reviewed the Contract Documents, including those of other Prime Contractors; visited the Site; become generally familiar with local conditions under which the Work is to be performed; and correlated personal observations with requirements of the Contract Documents. Prior to execution of the Agreement, the Contractor and each Subcontractor valued and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment and (v) other similar issues. The Owner assumes no responsibility or liability for the physical conditions or safety of the Project site of any improvements located on the Project site. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Section 3.2.1.

§ 3.2.2 The Contractor shall carefully study and compare the Drawings, the Specifications, Addenda and other Contract Documents relative to the Work shall take field measurements of any existing conditions related to the Work and shall observe any conditions at the Project site affecting the Work. Any design errors, omissions, or inconsistencies noted by a Contractor shall promptly be reported to the Construction Manager and Architect. Contractor acknowledges that the Contract Documents are full and complete, are sufficient to have enabled it to determine the Contract Sum and that the Drawings, the Specifications and all Addenda are sufficient to enable such Contractor to construct the Work outlined therein in accordance with applicable laws, statutes, ordinances, codes, building codes and regulations of any local, state, federal or any other governmental agency, and otherwise to fulfill all of its obligations under the Contract Documents.

§ 3.2.2.1 Except as to any reported errors, inconsistencies or omissions that have been acknowledged and corrected by the Architect and Construction Manager via Addendum, and to concealed or unknown conditions defined in Section 3.7.4, by executing the Agreement, the Contractor represents the following:

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.1 The Contract Documents are sufficiently complete and detailed for the Contractor to: (1) perform the Work required and to produce the results intended by the Contract Documents; and (2) comply with all requirements of the Contract Documents.

.2 The Work required by the Contract Documents, including, but not limited to, all construction details, construction means, methods, procedures, and techniques necessary to perform the Work, use of materials, selection of equipment, and requirements of product manufacturers are consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to Work; (3) requirements of any warranties applicable to the Work; and (4) all laws, statutes, ordinances, regulations, rules, orders, codes, and building codes of any state, federal or any other governmental agency which bear upon Contractor's performance of the Work.

§ 3.2.3 The Contractor shall satisfy itself as to the accuracy of all dimensions and locations. In all cases of interconnection of its Work with existing or other Work, the Contractor shall verify at the site all dimensions relating to such existing or other Work.. The exactness of grades, elevations, dimensions, or locations given on any Contract Documents or the work installed by other contractors is not guaranteed by the Architect, the Construction Manager or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3.1 Measurement: Before ordering any materials or doing any Work, each Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. No extra charge by the Prime Contractors or compensation to the Prime Contractors will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings. Any difference which may be found shall be submitted by the Prime Contractor to the Architect in writing for resolution before proceeding with the Work.

§ 3.2.3.2: Prior to proceeding with any Work, and in sufficient time as not to delay the Work, the Contractor shall:

.1 Review, compare and analyze the Contract Documents and any information or surveys provided by the Owner; and

.2 Inspect and check such portion of the Work for proper fit and matching with continuous Work and for proper coordination with other Work and the Work of the Owner or of Separate Contractors; and

.3 Verify all dimensions and measurements with actual field conditions at the Project.

§ 3.2.3.3: The Contractor shall immediately notify the Owner, Construction Manager, and Architect of any errors, omissions or inconsistencies noted as the result of the Contractor's activities under Section 3.2.3 as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require. If the Contractor knows or reasonably should know of any such error, omission or inconsistency and proceeds with the construction in question without first giving such notice and/or receiving a decision from the Architect, any claim for an adjustment to the Contract Sum or the Contract Time shall be deemed waived and released and the Contractor and its Surety shall assume all responsibility and liability on a joint and several basis for such performance and shall indemnify the Owner for all costs, expenses, losses and damages incurred by the Owner, including, but not limited to, legal fees, costs, and expenses, incurred by the Owner as the result thereof, including any cost to repair, correct or rework the construction in question.

§ 3.2.4 If the Contractor believes that additional cost or time will be required as a direct result of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3 and its sub-Sections, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3 and its sub-Sections, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies, or omissions in the Contract Documents, for differences between

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field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 The Contractor shall review the drawings and the Work of others to determine if that Work affects the Contractor's planned Work and also to coordinate and schedule all required Work.

§ 3.2.5 Explorations and Reports: Reference is made to the General Requirements and Bidding Documents for identification of those reports of explorations and tests of subsurface conditions at the Project site that have been utilized by Architect in preparation of the Contract Documents. Contractor may rely upon the accuracy of the technical data contained in such reports, but not upon non-technical data, interpretations or opinions contained therein or for the completeness thereof for Contractor's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.3.4, Contractor shall have full responsibility with respect to subsurface conditions at the Project site.

§ 3.2.8 Existing Structures: Reference is made to the Bidding Documents for identification of those drawings of physical conditions in or relating to existing surface structures which are at or contiguous to the Project site that have been utilized by Architect in preparation of the Contract Documents. Contractor may rely upon the accuracy of the technical data contained in such drawings, but not for the completeness thereof for Contractor's purposes. Except as indicated in the immediately preceding sentence and in subparagraph 4.3.4, Contractor shall have full responsibility with respect to physical conditions in or relating to such natures.

§ 3.2.9 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's requests for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.10 The Contractor shall be liable to the Owner and/or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or from differences between field measurements or conditions and the Contract Documents, if the Contractor knowingly fails to report such error, inconsistency, omission or difference to the Architect, or where the Contractor fails to carefully study and compare the Contract Documents relative to that portion of the Work for which the Contractor is responsible, such that, had Contractor done so, Contractor would have discovered such error, inconsistency or omission and reported same to Architect.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences, or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. The Contractor shall not perform the Work using its alternative means, methods, techniques, sequences, or procedures and shall not proceed with that portion of the Work without further written instructions from the Architect, Construction Manager and Owner. If the Contractor fails to give the requisite written notice and proposed changes to the Owner, Construction Manager and Architect before proceeding with the applicable portion of the Work or if the Contractor gives the requisite notice and proposed changes and then proceeds with that portion of the Work prior to receiving further written instructions from the Architect, Construction Manager and Owner, then the Contractor shall be solely responsible for any resulting loss or damage. If the Contractor gives the requisite written notice and proposed changes and then is instructed by the Owner to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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§ 3.3.1.1 The Contractor shall appoint a single representative on-site and shall designate the same in writing, who has the authority to act on behalf of the Contractor and its Subcontractors and suppliers. Contractor's supervision of Work shall include expediting and coordination of work of trades. Contractor shall perform all supervising and procuring required to ensure delivery of materials to maintain work schedules of sub-contractors and progress schedule of Project to ensure full completion of work, to supply equipment or instruments necessary to complete specified test, checks, balancing of system, to furnish operating instructions, etc. No Work shall be performed by Subcontractors onsite unless a Prime Contractor is on site to manage work of its Subcontractors.

§ 3.3.1.1.1 Project Manager The Contractor shall provide a qualified full-time staff member or members to manage its own work and the work of Contractor's Subcontractors. This Project Manager shall coordinate, organize and manage the project from the Contractor's main office and oversee the shop drawing process, signing off for quality assurance and conformance with the Contract Documents on each shop drawing. The Project Manager's resume will be provided to the Owner andshall be subject to the approval of the Owner, Architect and Construction Manager, who at all times have the right to require the Contractor to replace Project Manager if they fail to perform.

§ 3.3.1.1.2 The General Contractor's Project Manager shall conduct an onsite meeting at least once a week with the Superintendent and all other Prime Contractors and Subcontractors in attendance to coordinate the Project and review the schedule. The Construction Manager will attend but is not responsible for organizing or taking minutes. The General Contractor's Project Manager shall provide a meeting agenda and issue minutes within four working days of each meeting.

§ 3.3.1.2 At any time during the Project, the Owner, Architect, and Construction Manager shall have the right and authority, but not the duty, to require the replacement of the Contractor's Project Manager, Superintendent, or Foreman. The Construction Manager shall have the right and authority, but not the duty, to require the Contractor to assign additional supervisory personnel to the Project to ensure compliance with the schedule and quality requirements at no additional cost to the Owner and no increase in the Contract Sum. The Contractor shall not change or replace the assigned Superintendent without the prior written consent of the Owner.

§ 3.3.1.3 When more than one major phase is being constructed at different locations of the Project site, supervision must be assigned to each phase when Work of that Agreement is being performed. When performing construction Work to maintain the progress schedule requires extended hours, multiple shifts, and/or additional workdays, adequate supervision shall be required during these times. The competence level and ability of supervisory personnel must be adequate to perform the construction activities involved.

§ 3.3.1.4 Although these various second level supervision personnel may be reassigned from time to time, the Contractor shall retain one Superintendent with full responsibility while performing Work on the Project.

§ 3.3.1.5 The Contractor, its employees or its subcontractors shall not install any product or equipment in a manner that is in direct conflict with the manufacturer's recommended requirements. If the manufacturer of the product or equipment has requirements that cannot be met by the specific application indicated, the Contractor shall promptly bring this information to the attention of the Architect. Products or equipment that are installed contrary to their manufacturer's requirements shall be replaced at no additional cost to the Owner unless specifically authorized in writing by the Architect.

§ 3.3.1.6 The Project involves numerous complex plumbing, mechanical, electrical, and general construction installations, Contractor's representatives shall be sufficiently familiar with these trades to provide intelligent and efficient supervision, coordination, and scheduling through all phases of work.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.2.1 After Award of Contract, any claims for additional costs associated with completion of the Work within the required Contract Time will not be considered. If extra time in any form, such as shift work, overtime, or premium time, is necessary to meet Contract requirements regardless of trade, such costs have been already included in the

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Contract Sum. The Contractor represents that it has allowed for these shift, overtime, and premium time requirements and include the costs necessary to allow the other Prime Contractors to complete the Work within the specified time. Failure to recognize the extra costs in the Contract Sum shall not relieve the Contractor from utilizing shift, overtime, or premium time work in performance of its Contract nor entitle the Contractor to additional compensation. Where installation work is part of the Contract, all costs associated with meeting the time frames indicated in the construction schedules shall be included in the Contract Sum and the Owner shall incur no additional cost and there shall be no increase in the Contract Sum.

§ 3.3.2.2 No alleged verbal agreement or conversation with any officer, agent or employee of the Owner, Construction Manager or Architect, either before or after the execution of the Contract, shall affect or modify the terms or obligations herein contained. Failure to comply with any or all of the requirements of this Section 3.3 will not relieve the Contractor from the responsibility of properly estimating the difficulty or cost of successful completion of the Work, nor from the responsibility for the faithful performance of the provisions of this Contract. Modifications or changes may be made in writing only. This requirement may not be waived under any circumstances.

§ 3.3.2.3 The Contractor has reviewed the Substantial Completion dates and times for each milestone, phase and the entire Work of the Project set forth in the Contract Documents, agrees that such dates and times are reasonable, and commits to achieve them. The Contract Sum includes costs associated with completion by those dates and times, including, but not limited to, costs associated with out-of-sequence work, come-back work, stand-by work, stacking of trades, coordination with the schedules and work of other Prime and Separate Contractors, allowing sufficient time, work and storage areas, and site access for other Prime and Separate Contractors to timely progress and complete their work, and overtime, expediting, and acceleration that may be required to complete the Work by those dates and times. After award of Contract, no claims will be considered for any costs related to meeting the Project schedule.

§ 3.3.2.4 The Contractor, when requested, shall meet with representatives of the Architect and/or the Construction Manager and shall furnish all information requested; it shall allow the Architect and Construction Manager to inspect the Work at all times. The Owner, Construction Manager, Engineer, and/or the Architect shall not be liable to the Contractor for extra compensation or damages for interference or delays on account of any such meetings, information, or inspections so requested or other acts of the Architect done in good faith and within the scope of their employment by the Owner. Liability associated with delays attributed to other Contractors shall lie with the Contractor(s) that caused the delay and not with the Owner, Architect, or Construction Manager.

§ 3.3.2.5 The Contractor has the responsibility to ensure that all material suppliers and Subcontractors, their agents, and employees adhere to the Contract Documents, and that they order materials on time, taking into account the current market and delivery conditions and that they provide materials on time. The Contractor shall coordinate its Work with that of all others on the Project including deliveries, storage, installations, and construction utilities. The Contractor shall be responsible for the space requirements, locations, and routing of its equipment. In areas and locations where the proper and most effective space requirements, locations and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and coordinated installation to meet the needs of the Owner and the Project.

§ 3.3.2.6 The Contractor shall establish and maintain benchmarks and all other grades, lines, and levels necessary for the Work; report errors or inconsistencies to the Architect before commencing Work; and review the placement of the building(s) and permanent facilities on the site with the Owner and Architect after all lines are staked out and before foundation Work is started. Contractor shall provide access to the Work for the Owner, the Architect, other persons designated by Owner, and governmental inspectors. Any encroachments made by Contractor or its Subcontractor (of any tier) on adjacent properties due to construction as revealed by an improvement survey, except for encroachments arising from errors or omissions not reasonably discoverable by Contractor in the Contract Documents, shall be the sole responsibility of the Contractor, and Contractor shall correct such encroachments within thirty (30) days of the improvement survey (or as soon thereafter as reasonably possible), at Contractor's sole cost and expense, either by the removal of the encroachment (and subsequent reconstruction on the Project site) or agreement with the adjacent property owner(s)(in form and substance satisfactory to Owner in its sole discretion) allowing the encroachments to remain.

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§ 3.3.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

§ 3.3.3.1 A Prime Contractor's failure to perform its Work or whose negligence in performing its Work impacts other Prime Contractors or Separate Contractors shall be responsible for costs or damages incurred by the other contractors that are necessary to maintain the Project Schedule. Prime Contractor shall be responsible for costs or damages incurred by Owner and the other Contractors, including but not limited to, attorney fees and additional compensation of Construction Manager and Architect.

§ 3.3.4 The General Contractor is designated as the Project Coordinator for this Project. The Project Coordinator and other Prime Contractors are responsible for coordination of the Work. The Project Coordinator is responsible for making all coordination decisions not mutually agreed to by all affected Prime Contractors. Disputes between or among the Project Coordinator and one or more other Prime Contractors and disputes in connection with the construction schedule, the furnishing of additional resources to meet the project schedule, job coordination and all aspects of the means and methods of construction shall be submitted promptly to the Project Coordinator for a final construction decision. The Project Coordinator and the affected Prime Contractor or Contractors shall in connection with all submissions for a final construction decision provide actual written notice contemporaneously to the Construction Manager, Architect, and the Owner. The final construction decision of the Project Coordinator must, at all times, be consistent with content and intent of the Contract Documents and the latest accepted schedule and shall be subject to review and approval, rejection, or modification by the Construction Manager. The final construction decision of the Project Coordinator, as approved or modified by the Construction Manager, will be observed, accepted, and fully followed by all Prime Contractors and their Subcontractors on the project, subject only to the dispute resolution procedures set forth in Article 6 of these General Conditions. The progress of the Work in accordance with the final construction decision of the Project Coordinator, as approved or modified by the Construction Manager, shall not be delayed pending any such dispute resolution proceedings.

§ 3.3.4.1 Accurate dimensions, sleeved and opening drawings are to be submitted prior to placement in the field.

§ 3.3.4.2 The HVAC Contractor will prepare coordination drawings for all above-ceiling areas throughout the entire Project in coordination with the other trades who will participate in meetings and provide timely and comprehensive input. Drawings will show all piping, duct, cabletrays, electrical ductbanks, and similar items above ceiling,(but not electrical conduit less than 4 inches in diameter) in coordination with complete architectural, mechanical, and electrical reflected ceiling layouts, (including ductwork, conduits, piping, lighting, etc.

§ 3.3.4.3 The Contractor is responsible for any omissions of the subcontractors and is required to provide a complete operating facility.

§ 3.3.4.4 Each Contractor shall be responsible for preserving the integrity of ceiling heights and room sizes and shall:

- **.1** Check compatibility with equipment, other work, electrical characteristics, and operational control requirements.
- **.2** Check motor voltages and control characteristics.
- **.3** Coordinate controls, interlocks, wiring of pneumatic switches, and relays.
- **.4** Coordinate wiring and control wiring diagrams. Review the effect of changes on other work.
- **.5** Obtain and distribute installation data on each item of equipment requiring mechanical or electrical connections;
- **.6** Coordinate and observe start-up and demonstration of equipment and systems.
- **.7** Observe and maintain record of tests and inspections.
- **.8** Coordinate maintenance of record documents;
- **.9** Assist the Architect and Construction Manager with final inspections;
- **.10** Inform the Owner via the Construction Manager when coordination of the Owner's work is required
- **.11** Coordinate all mechanical, plumbing, electrical, food service and equipment/furnishings work, and coordinate that work with all other work.

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.12 Where space is limited, coordinate arrangement of mechanical, electrical, and other work to fit. Show plan and cross-section dimensions of space available, including structural obstructions and ceilings as applicable.

§ 3.3.5 The schedule of any Work affecting existing installations or facilities shall be coordinated with the other Prime Contractors, Separate Contractors, Owner ,and Construction Manager. At no time shall any of the Work or operations leading to Work defined in the Contract Documents interfere in any way with the Owner's day-to-day activities, service of power, light, heat, water, telephone, utilities, etc., which shall be maintained. Shutdown of utilities or equipment affecting existing operations will not be permitted except as provided below. Any premium time or additional cost to comply with these requirements shall be at the expense of the Contractor and shall be included in their bid. No shutdowns of existing installations and facilities, except by special permission, shall be scheduled between 5:00 a.m. and 6:00 p.m. All required shutdowns shall be during nights with the prior written approval of the Owner.

§ 3.3.6 Each Prime Contractor shall be responsible for the coordination of the work of other Prime Contractors and their own Work, so that no part will be left in an unfinished condition owing to disagreement among the various Prime Contractors as to where the Work of one begins and ends with reference to the Work of another. The Owner, Architect and its consultants, and the Construction Manager and its consultants, shall not be responsible for coordination of the Contractor's work. Prime Contractor shall deliver a fully completed Project to the Owner.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.1.1 Not later than seven (7) days from receipt of the Notice to Proceed, the Contractor shall provide a list of all products proposed for installation, including the name of the manufacturer of each, for approval by the Owner and Architect. The list shall be tabulated by, and be completed for, each Specification Section. Where applicable, Subcontractors' names shall be included in such list. Only those materials specified in the Contract Documents or approved by Addendum may be used in construction.

§ 3.4.1.2 Any material specified by reference to the number, symbol, or title of a specified standard, such as a Commercial Standard, a Federal Specification, a trade association standard, or other similar standard, shall comply with the requirements in the latest revision thereof, and any amendment or supplement thereto in effect on the date of submission of the Bid, except as limited to type, class or grade, or modified in such reference. The standards referred to, except as modified in the Specifications, shall have full force and effect as though printed in full in the Specification.

§ 3.4.1.3 The various materials and products specified in the Contract Documents by name or description are given to establish a standard of quality and of cost for bid purposes. Unless materials or products specified are indicated as "no substitutions" or words to that effect, then it is not the intent to limit Bidder, the Bid, or the evaluation of the Bid to any one material or product specified, but rather describe the minimum standard. When proprietary names are used, they shall be followed by the words "or alternatives of the quality necessary to meet the specifications." Materials of manufacturers other than those mentioned throughout the specifications may be accepted if they are equal in quality and performance to those specified **and** written approval is given by the Architect prior to Bid submittal. Any other substitution request procedures are further defined in the Contract Documents.

§ 3.4.1.4 Contractors will not be permitted to use partially completed spaces for storage or office areas. When by exception the Construction Manager allows any room to be used as a shop, storeroom, etc., during the progress of the work, the Contractor making use of the space will be responsible for any repairs, patching, or cleaning arising from such use. Prior approval of Construction Manager for use of such areas is mandatory and contractors will be required to allow full access to other trades for work activities.

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§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive. Contractor shall pay Architect directly for any costs associated with reviewing substitution requests and revising the Drawings and Specification as a result of any substitution requests.

§ 3.4.2.1 After the Agreement has been executed, the Owner will not consider a request for the substitution of products in place of those specified.

§ 3.4.2.2 If the Contractor makes a request for substitution, such request shall be deemed to be Contractor's:

.1 Representation that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to the specified product.

.2 Representation that the Contractor will provide the same warranty for the substituted product that the Contractor would for the specified product.

.3 Certification that the cost data presented is complete and includes all related costs under this Agreement except the Architect's redesign costs and waives all claims for additional cost related to the substitution which subsequently become apparent.

.4 Representation that it will coordinate the installation of the accepted substitute product and make such changes as may be required for the Work to be complete in all respects without additional cost to the Owner.

.5 Representation that the use of the substituted product will not have an adverse effect on any other trade or the construction schedule. However, to the extent that the incorporation of a substituted item or assembly into the Work will require revisions or additions to the Work of other construction contracts, the Contractor proposing to use such substituted materials, products, or assembly represents that it will bear the cost of such revisions or additions for all applicable trades of Work at no change in the Contract Sum.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. Owner specifically reserves the right to reject any person that Owner deems unfit to be permitted on the Project site. Upon written notice from the Owner, the Contractor shall have all such persons removed from the Project site. Owner's right to declare such person unfit shall not be limited to the required exclusion of persons from school property as set forth in Section 1-111 of the Pennsylvania Public School Code and/or Subchapter C.2 of the Child Protective Services Law.

§ 3.4.3.1 Competent Workmen: No person shall be employed to do Work under the Contract except competent and first-class workmen and mechanics. No workmen shall be regarded as competent and first class, except those who are duly skilled in their respective branches of labor, and who shall be paid not less than such rates of wages and for such hours of work as shall be established and current rates of wages paid for such hours by employers of organized labor in doing of similar work in the district where the Work is being done. The Contractor shall not employ workers, means, materials or equipment which may cause strikes, work stoppages or any disturbances by workers employed by the Contractor or the Owner or Subcontractors in connection with the Work of the Project or the location thereof. The Contractor agrees that all disputes as to jurisdiction of trades shall be adjusted in accordance with any plan for the settlement of jurisdictional disputes which may be in effect either nationally or in the locality in which the Work is being performed and that it shall be bound and abide by such adjustments and settlements of jurisdictional disputes, provided that the provisions of this Section shall not be in violation of or in conflict with any provisions of law applicable to the settlement of such disputes. Should the Contractor fail to carry out or comply with any of the foregoing provisions, the Owner shall have the right, in addition to any other rights and remedies provided by the Contract Documents, at law or at equity, after three (3) days' written notice mailed or delivered to the last known address of the Contractor, for all or any portion of the Work, and, for the purpose of completing the Work, to enter upon the premises and take possession. Workmen shall strictly comply with Drug and Alcohol-Free Workplace program set forth in the Contract Documents.

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§ 3.4.3.2 The Contractor shall abide by the following requirements, which shall apply to all Contractors, all Subcontractors of any tier, and all employees of all Contractors and all Subcontractors of any tier:

.1 They shall not socialize with the students, faculty, visitors, or patrons.

.2 They are prohibited from smoking, vaping, and other use of tobacco in buildings and on the grounds owned by or under the control of the Owner. Any warning associated with use of prescription drugs must be complied with, particularly warning against operation of machinery and equipment.

.3 They shall not use radios on the site for music or entertainment purposes.

.4 They shall not possess, or consume, or be under the influence of alcoholic beverages when on site.

.5 They shall not use, possess, or be under the influence of any illegal substances (i.e., drugs, etc.) while on site.

.6 They shall not carry, possess, or store handguns, firearms, or weapons of any kind while on the Project site, regardless of whether the person has registered the weapon or is licensed to carry a concealed weapon.

.7 Inappropriate language, dress or conduct will not be tolerated on the Project site.

.8 No horseplay or rough-housing will be allowed.

.9 No sexual, racial, or ethnic harassment, or similar conduct will be tolerated.

.10 All employees shall use proper sanitation habits including use of toilet facilities and garbage cans. All employees shall dress in clothing appropriate for the work they are to perform. All personnel are to wear hardhats, safety shoes, glasses, gloves, masks or respirators, noise protection devices, and other protective clothing and equipment as required by OSHA standards.

Failure to comply with the above requirements may result in the Owner requiring the offending party to be removed from the Project and not allowed to return.

§ 3.4.3.4 The Contractor shall require its employees and agents, and its Subcontractor's employees and agents to work diligently and behave in an orderly manner at all times when at or about the Project site and shall remove from the Project any employee whose conduct is deemed objectionable.

§ 3.4.3.5 Contractor shall be responsible for labor peace on the Project and shall at all times make its best efforts and judgment as an experienced contractor to adopt and implement policies and practices designed to avoid work stoppages, slowdowns, disputes, or strikes where reasonably possible and practical under the circumstances, and shall at all time maintain Project-wide labor harmony. Except as specifically provided in Subparagraph 8.3.1, Contractor shall be liable to Owner for all damages suffered by Owner occurring as a result of work stoppages, slowdowns, disputes, or strikes.

§ 3.4.4 Contract Sum Not Adjusted for Rising Costs: The Bid (and hence the Contract Sum) for the Contract must be guaranteed for the duration of this Project and shall thereby have incorporated within it any or all escalation factors related to market conditions. Notwithstanding any other provision in the Contract Documents to the contrary, Contractor's Contract Sum is intended to include all increases in cost, foreseen or unforeseen, including, without limitation, increases in costs arising from supply shortages, unusual delay in deliveries, increases in market prices for materials, labor, taxes and/or other causes beyond the Owner's control, all of which are to be borne solely by the applicable Contractor supplying the materials and/or labor to the Project. All loss and/or damage arising from any of the Work performed under this Agreement through unforeseen or unusual obstructions, difficulties or delays which may be encountered in the prosecution of same shall be borne solely by the applicable Contractor prosecuting the Work.

§ 3.4.5 The Contractor shall ensure that products incorporated into, and used to execute, the Work of the Project are free from asbestos, lead, and other hazardous materials. If any suspected asbestos- or lead-containing material is installed, the Owner has the right to have the material in question tested and if proven to contain asbestos, the Contractor shall remove all material in question and replace it with new acceptable material at no additional cost to the Owner and shall pay for costs associated with testing of the suspected material.

§ 3.4.6 Overtime: Any work necessary to be performed after regular working hours, on Sunday or Legal Holidays, shall be performed without additional expense to the Owner.

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§ 3.4.7 The equipment and procedures used on portions of the Work shall be such that no damage to adjacent property or roadways will result from their use. No work of any kind shall be installed or stored in a manner which will endanger the structure of the building.

§ 3.4.8 Material Shipments: The Contractor in making or ordering shipments shall not consign or have consigned materials, equipment, or any other items in the name of the Construction Manager, Architect, or the Owner. None of the Construction Manager, Architect or the Owner shall be under any obligation to make payment for charges on shipments made by or to the Contractor.

§ Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The warranty provided in this Section shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law. The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.3 The Contractor hereby guarantees the Work to the full extent provided in the Drawings, Specifications, these General Conditions, and other Contract Documents. The Contractor shall make good without cost to the Owner for any defective portion of the Work, including other Work damaged thereby, within seventy-two (72) hours of being notified of the defective Work. Owner's rights and remedies hereunder shall be in addition to any other rights and remedies which the Owner may have pursuant to law, equity, or other portions of the Contract Documents. Without limitation by the foregoing, the Contractor shall pay in addition for all damage to the Project resulting from defects in the Work and all costs and expenses necessary to correct, remove, replace and/or repair the Work and any other work or property which may be damaged in correcting, removing, replacing, or repairing the Work, as well as any consequential damages the Owner may suffer. If the Contractor fails to adhere to this provision, the Owner will be entitled to, in seeking to enforce its rights, recover legal fees, consultant and expert witness fees, or any other expenses incurred by the Owner.

§ 3.5.4 The Contractor shall forward guarantee and warranty registration cards to the manufacturers in the name of the Owner showing the date of acceptable Substantial Completion of the Work as the beginning date for guarantee and warranty periods.

§ 3.5.5 The Contractor represents that all manufacturer and supplier warranties shall run directly to or be specifically assignable to the Owner. The Contractor warrants that all portions of the Work that will be covered by a manufacturer's or supplier's warranty shall be performed in such a manner so as to preserve all rights under such warranties. The Contractor hereby assigns to the Owner effective upon the expiration or termination of this Contract all manufacturer's and supplier's warranties relating to the Work, and the Contractor shall upon request of the Owner, execute any document reasonably requested by the Owner to effectuate such assignment. If the Owner attempts to enforce a claim based upon a manufacturer's or supplier's warranty, and such manufacturer or supplier refuses to honor such warranty based in whole or in part on a claim of defective installation by the Contractor, the Contractor shall be responsible for any resulting loss or damages incurred by the Owner as a result of the manufacturer's or supplier's refusal to honor such warranty. The Contractor's obligations under this Subparagraph 3.5.5 shall survive the expiration or earlier termination of the Contract. The warranty period for all Work of each Contractor shall be two

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(2) years from the date of final inspection and acceptance by the Owner unless otherwise specified. The Mechanical Contractor shall provide a total of three (3) years warranty for all mechanical equipment that has a compressor.

§ 3.6 Taxes

§ 3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect. The Owner is exempt (excluded) from sales and/or use tax in Pennsylvania on certain transactions. Contractor and all subcontractors shall bid and shall purchase as exempt (excluded) from Pennsylvania sales and/or use tax all tangible personal property within the definition of 'building machinery and equipment' as that term is defined in Act No. 45-1998. No charges for tax shall be allowed for such exempt items. It shall be the Contractor's responsibility to determine those items for which an exemption will apply, and the Contractor shall obtain legal or other tax advice to determine how and to what extent an exemption form the taxes apply.

§ 3.6.2 The Contractor hereby accepts and assumes full and exclusive liability for payment of all sales taxes, state and municipal taxes including, without limitation, business privilege taxes, use taxes, and all contributions and payroll taxes under the provisions of Federal law or the laws of the Commonwealth of Pennsylvania, including, but not limited to, Social Security Acts, as to all employees engaged in the performance of the Work subject to this Agreement, and further agrees to meet all requirements that may be specified under regulations of government officials having jurisdiction over the Work. All such taxes are expressly included within the compensation owed to the Contractor under the terms of this Agreement. It is further agreed that the Owner shall have the right to deduct the amount of any and all such taxes from the compensation owed to the Contractor under the terms of this Agreement at any time, in the Owner's sole discretion, as the Owner deems advisable, it being agreed that the Owner shall have the right to deduct any and all such moneys from the next payments due under the Agreement and from the retained percentages.

§ 3.6.3 The Contractor hereby accepts and assumes full and exclusive liability for and shall indemnify, defend, protect, and save harmless the Architect, Construction Manager and Owner from and against the payment of:

.1 All contributions, taxes or premiums (including, without limitation, interest and penalties thereon) which may be payable under any unemployment insurance laws of any state, the Older Workers Benefit Protection Act of 1990 (OWBPA) (P.L. 101-433, October 16, 1990, 104 Stat. 978), as amended from time to time, the Federal Social Security Act, as amended from time to time, Federal, State, County and/or Municipal tax withholding laws, or any other laws, measured upon the payroll of or required to be withheld from employees, by whomever employed, engaged in the Work.

.2 All sales, use, personal property and other taxes (including, without limitation, interest and penalties thereon) required by any Federal, State, County, Municipal or any other laws to be paid or collected by the Contractor or any of its Subcontractors or vendors or any other person acting for, through or under it or any of them by reason of the performance of the Work or the acquisition, ownership, furnishing or use of any materials, equipment, supplies, labor, services or other items for or in connection with the Work.

.3 All pension, welfare, vacation, annuity and other employee and union benefit contributions payable under or in connection with labor agreements with respect to all persons, by whomsoever employed, engaged in the Work.

.4 In the event that any law is or has been passed, or any rule or regulation pursuant thereof is enacted, which requires the Owner to pay, either directly or indirectly, the amount of any such sales, use, personal property and other taxes (including, without limitation, interest and penalties thereon) required by any Federal, State, County, Municipal or any other laws or should any such law, rule or regulation direct the Owner to collect the same, or make the Owner liable for the collection thereof, or make the Owner responsible therefor, it is covenanted and agreed that the Contractor shall fully and completely make all payments therefor, and shall fully and completely indemnify and save the Owner harmless from any and all such taxes.

§ 3.6.4 The Contractor shall base its Bid on the properly charged, collected, and remitted sales tax due on only those "construction activities" which will become a permanent part of the real estate in accordance with 61 Pa. Code Section 31.11, et seq., as amended from time to time. The Contractor shall not include in its Bid any tax for "sales activities" which do not become a permanent part of the real estate in accordance with 61 Pa. Code Section 31.11, et seq., as amended from time to time.

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§ 3.6.4.1 The Contractor shall keep detailed records of all materials, equipment, and labor furnished in connection with the Work and shall keep such full and detailed accounts as may be necessary for the proper financial management under this Agreement and the system utilized by the Contractor shall be satisfactory to the Owner. The Owner or its representative shall be afforded access to the Contractor's records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, certifications, and similar data relating to this Agreement. Further, the Contractor must provide the Owner with certified payroll records in compliance with Section 16.3 for the labor furnished by the Contractor in connection with the Work. Contractor shall, at no additional charge to Owner, provide all necessary information and participate in any audits conducted on the Project, both during and after its completion, at the request of the Owner.

§ 3.6.4.2 The Contractor shall preserve all such records for a period of three (3) years, or for such longer period as may be required by law, after final payment. To the extent requested by Owner, copies of such records shall be provided by the Contractor, and the Contractor shall immediately transmit to the Owner copies of all invoices and receipts for materials, equipment, and labor furnished in connection with the Work by the Contractor and any other materials that reflect sales and use tax paid or not paid.

§ 3.6.4.3 Contractor shall require all of its Subcontractors to preserve and make their records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, certifications, and similar data relating to the Work for a period of three (3) years, from the date of Final Completion or for such longer period as may be required by law, after final payment.

§ 3.6.4.4 The Contractor agrees to assign and transfer to the Owner all of its rights to sales and use tax which may be refunded as a result of a claim for refund for materials and/or equipment purchased for the Project. The Contractor further agrees that it will not file a claim for refund for any sales or use tax which is the subject of this assignment. This assignment will include, without limitation, any tax erroneously paid by the Contractor. Further, the Contractor agrees to execute all such documents as may be necessary to effectuate such an assignment.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 The Contractor shall secure, and Owner will reimburse at no markup or pay directly, all permits, fees, licenses, and inspections required for construction. The Contractor shall secure and pay for all necessary administrative costs, insurances, business privilege licenses, certifications, or taxes to apply for the necessary permits required to perform the Work. If required by local or state law, the Contractor shall secure all professional licenses and/or certifications required to perform the Work.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.2.1 It is the responsibility of the Contractor to determine what local ordinances, if any, will affect its Work. The Contractor shall check for any County, Borough, or Township rules or regulations applicable to the area in which the Project is being constructed and, in addition, the Contractor shall check for any rules or regulations of other organizations having jurisdiction, including, without limitation, chambers-of-commerce, planning commission, railroads, industries, or utility companies who have jurisdiction over the Project site and/or the Work. Any costs of compliance with local controls shall be included in the Contract Sum, even though documents of such local controlling agencies are not listed herein.

§ 3.7.2.2 The Contractor shall comply with all aspects of the Federal Occupational Safety and Health Act of 1970 (O.S.H.A.) including specific responsibilities to perform reporting and recording requirements. The Contractor is responsible to obtain information regarding its responsibilities under the Act.

§ 3.7.2.3 The Contractor shall comply with all aspects of Pennsylvania Act 287 (December 10, 1974), requiring among other things that each Contractor who intends to perform excavation or demolition work in a site within a political subdivision, ascertain the location and type of utility lines and pipes at each site and notifies the utility company(s) three working days in advance of performing the excavation or demolition. Call Pennsylvania One Call System, Inc. (1-800-242-1776). The Contractor shall be responsible for timely notification to and coordination with all utility companies regarding the provision of services to the Project. The Contractor shall inform the Architect at once when

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the Owner's participation is required, and the Architect shall immediately notify the Owner. Connections for temporary and permanent utilities and payment for temporary utilities services required for the Work are the responsibility of the Contractor unless otherwise agreed in writing. Payment for temporary and/or permanent utility services shall be the responsibility of the Contractor until Substantial Completion.

§ 3.7.2.4 The Contractor at all times shall observe and comply with all Federal and State Laws and local ordinance and regulations in any manner affecting the conduct of work and all such orders or decrees as exist at present and those which may be enacted later by bodies or tribunals having jurisdiction or authority over the Work and shall indemnify, defend, and save harmless the Owner and all its officers, agents and servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulations, order or decree, committed by Contractor, its subcontractors, or any of their agents or employees. Any cost of compliance with such Federal and State laws and local ordinances and regulations shall be included in the prices bid even though explicit reference to such Federal and State laws and local ordinances are not listed herein.

§ 3.7.2.5 Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

§ 3.7.3 It shall be the obligation of the Contractor to review the Contract Documents and to determine and to notify the Owner, the Architect, and the Construction Manager of any conflict, inconsistency, or discrepancy between standards, codes, laws, ordinances, building codes and regulations of which the Contractor has knowledge or should be reasonably able to determine. The Contractor shall not violate any zoning, setback or other requirements of applicable laws, codes, standards, regulations and/or ordinances, or of any recorded covenants of which the Contractor has knowledge. If the Contractor observes that portions of the Contract Documents are at variance with applicable laws, statutes, ordinances, building codes, standards, codes, rules or regulations, the Contractor shall notify the Architect and Construction Manager promptly in writing, and necessary changes shall be accomplished by appropriate modification.

§ 3.7.3.1 If the Contractor, any of its Subcontractors or any Sub-Subcontractors, performs Work contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Construction Manager, Architect, and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs, including but not limited, any fines or penalties from governmental authorities and the costs of corrective actions or replacement.

§ 3.7.3.2 Prior to application for final payment, Contractor may be asked to furnish a written certification that the Work is in conformance with applicable laws, ordinances, rules, regulations, and lawful orders.

§ 3.7.3.2 To the extent Contractor pays for any permit, connection and/or tap-in fee not otherwise properly due, the Owner shall be entitled to any refund relating thereto and the Contractor agrees to assign any and all rights to said refund claim to the Owner. If any additional permit fees are required, then Contractor shall receive prior approval of Owner to pay such fees. In such case, the Contractor and all Subcontractors hereby assign to Owner all rights to claim any such refund claim and to any resulting refund and hereby appoint to the Owner as Attorney-in-Fact to execute and acknowledge in their respective names and to prosecute such refund claims before administrative agencies and courts in Pennsylvania having jurisdiction over such claims. The Owner or its agent shall have the right to review the books and records of Contractor and all subcontractors for the purpose of documenting and substantiating any such refund claim. Contractor and all subcontractors shall fully cooperate with Owner in pursuing any such refund claim and shall make available to Owner any applicable documents.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall contemporaneously provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 10 days after first observance of the conditions. The Architect and

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Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that the conditions differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, may recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. Claims by the Contractor in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Time arising from the existence of such remains or features may be made as provided in Article 15. If Contractor notifies the Owner, Construction Manager, and/or Architect of any of the conditions set forth in this Section, Owner shall have the right, in such event, to terminate the Agreement, and upon payment to Contractor of all sums due as of the date of termination, Owner shall have no further liability or responsibility to Contractor under the Contract Documents.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all quantity allowances stated in the Contract Documents. Items and materials covered by allowances shall be supplied by the Contractor in the amounts indicated in Division 01 Section "Quantity Allowances."

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2;
- **.4** Upon execution of a Change Order addressing an item covered by an allowance, the allowance will be reduced by the value of the change order and the Contract Sum shall be adjusted accordingly to reflect the pricing in the Change Order; and
- **.5** The Contractor cannot bill for any Work associated with an allowance unless there is a signed executed Change Order for the Work.

§ 3.8.3 Intentionally deleted.

§ 3.8.4 NO CASH ALLOWANCES are included in the Contract Documents for any purpose.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The Superintendent shall represent the Contractor, and communications given to the Superintendent shall be as binding as if given to the Contractor. At the request of the Construction Manager, Architect or Owner, the Contractor's Superintendent shall attend Project meetings, whether the Project meetings are prior to the start of the Contractor's work or subsequent to the completion of the Contractor's work. The Superintendent shall be on the Project site full time during the progress of the Work until the day of

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Substantial Completion of the entire Project and for such additional time thereafter as the Construction Manager may determine to be necessary for the expeditious completion of Work. If, during the course of the project, it is evident that the superintendent is not competent, is not managing the progress of the Work, or is not coordinating the supervision of the various trades under the Contract, the Owner or Construction Manager may require the replacement of the superintendent with an acceptable superintendent.

§ 3.9.2 Each Contractor, within ten (10) days of receipt of the Notice to Proceed, shall furnish in writing to the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed Superintendent. The proposed Superintendent's resume shall include at least 3 recent projects of similar contract size and scope, with the names and telephone numbers of Owner and Architect representatives for each project. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed Superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection. The Project Superintendent must be approved by the Owner and Architect prior to the start of Work.

§ 3.9.2.1 The Contractor's Superintendent shall coordinate, organize, and oversee the Contractor's work and the work of the Subcontractors. Should the Contractor be responsible for multiple projects at different sites, or multiple locations at one large site, then the contractor shall provide a separate qualified Superintendent for each of the projects or lactations. The Superintendent shall be responsible for onsite safety, quality assurance, conformance with the Contract Documents and perform coordination with other Contractors and Subcontractors.

§ 3.9.3 The Contractor shall not employ a proposed Superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Superintendent shall be on site full-time from the Notice to Proceed date, and the Contractor shall not change the Superintendent without the Owner's and Construction Manager's consent, unless the Superintendent proves to be unsatisfactory to the Contractor and ceases to be in the Contractor's employ. If any Contractor should at any time fail to provide adequate supervision and superintendence, as may be evidenced by incomplete, delayed or non-conforming Work, the Owner may provide supervision and superintendence and the cost thereof, including, but not limited to, compensation for additional professional services, legal fees, or other costs or expenses incurred, shall be charged to the applicable Contractor in the form of a Change Order incorporating an appropriate reduction in the Contract Sum. If the payments due to the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner. The Owner and/or Construction Manager shall have the right to dismiss from the Project any Superintendent whose performance is not satisfactory in the sole discretion of the Owner. If during the course of the Project it is evident that the Superintendent is not competent or is not managing the progress of the Project or is not coordinating the various trades, entities, and/or persons under his/her supervision, then the Construction Manager will document such findings to the Contractor. If within 10 days of receiving such notice, no substantial effort or correction of the finding is made known to the Construction Manager, then the Construction Manager, as requested by the Owner, may require the immediate replacement of the Superintendent with an acceptable one at no additional cost to the Owner. The Owner also reserves the right to interview and approve the proposed substitute Superintendent. The Owner reserves the right to deduct $800.00 per day from the Contract Sum, as liquidated damages and not as a penalty, for each day that a qualified Superintendent is not on site for the entire day.

§ 3.9.4 As a consideration of the Contract between the Owner and the Contractor, the Contractor shall retain the same Superintendent for its Work on the Project while on the Project. The Superintendent shall not be reassigned from this Project prior to completion, unless by termination of employment by the Superintendent or the Contractor, or if required by the Construction Manager or by the Owner in accordance with Section 3.9.3.

§ 3.10 Contractor's Construction and Submittal Schedules

§

§ 3.10.1 General

§ 3.10.1.1 The Project will be scheduled and monitored with Critical Path Method (CPM) techniques using, at a minimum, Microsoft Project or Primavera Suretrak scheduling software for Microsoft Windows. The General Contractor's consultant shall develop the schedule (in coordination with the Construction Manager and other Prime Contractors) in sufficient detail and clarity so that the Contractors can plan, schedule and control the Work properly

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and so that the Construction Manager can readily monitor and follow the progress for all portions of the Work. The Construction Manager shall receive electronic copies of all schedules and updates. The General Contractor shall complete a Preliminary 45-day schedule and submit it to the Architect and Construction Manager within fifteen (15) calendar days after notice to proceed. The initial detailed schedule for the entire Project must be submitted and accepted by the Architect and Construction Manager prior to release of the second application for payment. The schedule in no way takes the place of Contractor field coordination.

§ 3.10.1.2 This section describes the Critical Path Method ("CPM") Progress Schedule requirements. Each Prime Contractor shall provide all necessary information in connection with their Work to the General Contractor within two (2) business days of written request from the General Contractor. The Owner will also have specific needs for phasing of site/construction access and other issues as outlined in the Contract Documents which are to be coordinated within the schedule. No additional costs will be considered to coordinate the phasing needs and reasonable sequencing needs of the Owner. Mandatory scheduling meetings will be held after the General Contractor completes the Preliminary 45-day schedule, at which time all Prime Contractors will provide the anticipated start dates and durations for their own Work and the Work of their Subcontractors for incorporation into the Detailed schedule.

§ 3.10.1.3 The General Contractor shall prepare all schedules and all monthly updates based upon information furnished by the Prime Contractors and based on the Construction Manager's observations of the Work in progress. The schedule shall be based upon each of the Prime Contractor's working schedule and used to plan and organize the Work (in conjunction with the General Contractor's field coordination efforts), record and report actual performance and progress, and show how the Prime Contractor(s) plan to complete all remaining Work.

§ 3.10.1.4 The completed Detailed CPM Schedule shall be distributed to all Prime Contractors and to the Construction Manager. When the schedule is accepted by the Prime Contractor(s) and accepted by the Owner, it shall become one of the Contract Documents. Following submission to the Owner and Construction manager and the approval by the Owner and/or Construction Manager, the CPM schedule may be revised to show changes in the Contractor's method or manner of performance and delays, changes, additions, or deletions of the Work. Such revised CPM schedule shall only become operative after submission by the General Contractor to the Construction Manager and Owner and subsequent Construction Manager and Owner's acceptance.

§ 3.10.1.5 The Contractor acknowledges that float belongs to the Project and can be shared by the Owner and the Prime Contractor(s), as determined by the Architect, Construction Manager, and Owner .

§ 3.10.1.6 Preliminary 45-Day CPM Schedule

§ 3.10.1.6.1 The General Contractor, in conjunction with the Construction Manager and the other Prime Contractors, shall develop a Preliminary 45-Day CPM Schedule within fifteen (15) calendar days after the Notice to Proceed (NTP). This Preliminary 45-Day CPM Schedule will be a computerized CPM Schedule showing only the early start and early finish of each work activity. The Preliminary 45-Day CPM Schedule will contain work activities over the first forty-five (45) calendar days, and the estimated durations for each work activity will be fifteen (15) calendar days or less. The balance of the job shall be shown in summary logic in the Detailed CPM Schedule. The Preliminary 45-Day CPM Schedule will include, but not be limited to, key procurement activities (i.e., submissions, approvals, fabrication/delivery), mechanical/electrical/plumbing/fire protection coordination, and any field work that will occur during the first forty-five (45) days. This Preliminary 45-Day CPM Schedule will become part of the Detailed CPM Schedule.

§ 3.10.1.7 Detailed CPM Schedule

§ 3.10.1.7.1 The General Contractor will meet with all Prime Contractors and the Construction Manager within seven (7) calendar days after the issuance of the Preliminary 45-Day CPM Schedule for the purpose of identifying all the scheduling input required for the General Contractor to produce the Detailed CPM Schedule. Within seven (7) calendar days of this meeting, the General Contractor will then prepare the draft Detailed CPM Schedule.. All Prime Contractors and the Construction Manager shall review the Detailed CPM Schedule and note any corrections required as a condition of acceptance within seven (7) calendar days of receipt. The General Contractor will prepare a finalized copy of the Detailed CPM Schedule acknowledging the Prime Contractors' acceptance of the Detailed CPM Schedule as their plan to construct the Project. The accepted Detailed CPM Schedule will used by

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the Construction Manager to monitor the progress of the Work. Subsequent meetings to discuss the Detailed CPM Schedule may be required with the Construction Manager and all Prime Contractors. Comments on the Detailed CPM Schedule will be sent to the General Contractor and the Construction Manager simultaneously.

§ 3.10.1.7.2 The Detailed CPM Schedule shall comply with the various limits imposed by the scope of Work and by any contractually specified intermediate milestone dates and completion dates included in the Contract Documents. The degree of detail in the Detailed CPM Schedule shall be to the satisfaction of the Construction Manager.

§ 3.10.1.7.3 Activity durations in the Detailed CPM Schedule will be measured in eight (8) hour workdays and will have a maximum duration of twenty (20) workdays, except in the case of non-construction activities such as procurement of materials and delivery of equipment. The Project calendar shall consider and reflect planned non-workdays for weekends, holidays, weather days, and planned premium work such as shift work and extended workdays. Milestones will be clearly identified. Intermediate milestones will be required, including but not limited to, anchor bolt setting, structural steel delivery/erection, sequencing of building areas, building enclosure, overhead rough-in, phased completion of various areas, etc. The Substantial Completion date shall be fixed and shall not change regardless of any changes to the schedule.

§ 3.10.1.7.4 The General Contractor will furnish the Construction Manager and each Prime Contractor with a copy of the final initial Detailed CPM logic diagram, computer printouts, detailed bar chart, and summary bar chart. The General Contractor will also provide to the Construction Manager electronic versions of the Detailed CPM Schedule and any updates on a USB drive.

§ 3.10.1.7.5 If the General Contractor fails to produce an acceptable Detailed CPM Schedule as determined by the Construction Manager, the Construction Manager may take over the scheduling requirements and deduct the cost of same from the General Contractor's Contract Sum.

§ 3.10.1.7.6 In the event a dispute arises regarding the interpretation of the Project's Detailed CPM Schedule requirements, the Architect, in consultation with the Construction Manager, will make the final decision as to interpretation.

§ 3.10.1.7.7 The schedule activities will be coded to facilitate selection, sorting, and preparation of reports. Each activity will have a unique number and description. All construction activities shall be manpower and resource loaded. The following activity coding scheme should be used -

.1 Responsibility – Identify Contractor, Owner, etc.
.2 Area – Subdivide schedule activities into logical sections including site, building areas, wings, floors, procurement
.3 Activities to be separate and include all major submittals, approvals and fabrication/delivery times.
.4 CSI – 5 digit 16 division CSI format to be assigned.

§ 3.10.1.7.8 The following computer outputs may be required by the Construction Manager as part of the initial Detailed CPM Schedule submission and each monthly update thereafter: General Contractor shall provide the Construction Manager with a USB drive of the Detailed CPM Schedule with each submission.

.1 Critical Activity Sort (float equals 10 day or less)
.2 Early start sort
.3 Eight (8) week "Look Ahead" detailed bar chart
.4 Summary bar chart
.5 Additional computer sorts as required by the Construction Manager.

§ 3.10.1.7.9 The Detailed CPM Schedule and all monthly updates shall show: Activity ID, Activity Description, Original Duration, Remaining Duration, Percent Complete, Early Start, Early Finish, Late Start, Late Finish and Total Float.

§ 3.10.1.8 Schedule Updates

§ 3.10.1.8.1 The Preliminary 45-Day CPM Schedule will be updated until the Detailed CPM Schedule is approved/signed off by each Prime Contractor and accepted by the Owner and the Construction Manager.

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§ 3.10.1.9 Each Prime Contractor is required to attend and participate in a monthly CPM update review meeting with the General Contractor and Construction Manager. Attendance is mandatory and every effort will be made to have the scheduling meetings immediately following a job meeting. Each Prime Contractor will supply updated information including a complete and accurate report of procurement items and work activities. The schedule update information will include, but not be limited to:

.1 Actual start dates
.2 Actual completion dates
.3 Activity percent completion
.4 Remaining duration of activities in progress

§ 3.10.1.10 All updated schedule information outlined above will be reviewed by the Construction Manager at the update meeting. General Contractor shall provide the Construction Manager with all reports as specified in previous paragraphs within 5 calendar days of the meeting. No logic, original duration, or other changes shall be made to the Detailed CPM Schedule without approval from the Construction Manager. The Construction Manager may request a Claims Digger report for any updates.

§ 3.10.1.11 Following the update meeting, the General Contractor shall then prepare an eight (8) week look-ahead bar chart that will be issued to all Prime Contractors at the next job meeting. A copy of all updated Detailed CPM Schedule documents will be available to each Prime Contractor for review at the Construction Manager's jobsite trailer.

§ 3.10.1.12 Recovery Schedule

§ 3.10.1.12.1 If a Prime Contractor fails to achieve the planned progress in the Work, as indicated in the approved/updated Detailed CPM Schedule and/or the Prime Contractor's lack of progress delays the Critical Path and/or an intermediate milestone by more than ten (10) calendar days (monthly or cumulatively), the Prime Contractor will submit to the Construction Manager for approval a proposed Recovery Schedule indicating how the Prime Contractor will recover the time lost.

§ 3.10.1.12.2 If a Prime Contractor fails to submit a Recovery Schedule and/or fails to cooperate with the Recovery Schedule process, the Construction Manager can immediately order the Prime Contractor to accelerate completion of the late activities by whatever means necessary, including additional personnel, equipment, overtime, double shifts, etc., without any additional costs to the Owner. The Owner/Construction Manager can withhold future progress payments until the Contractor's progress is in compliance with the Project schedule or until the Owner has approved by Change Order proposed adjustments to the Project milestones, extension of Contract Time, or modification of the Project schedule.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's review. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect 14 days from time of receipt to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall cooperate, participate, and consult with other Prime Contractors during the Work of this Project. The Contractor shall schedule and execute their Work to avoid delay to other Prime Contractors, the Owner's own forces, or other Separate Contractors. The Contractor shall be financially responsible for undue delay they cause to other Prime Contractors, Owner, and Separate Contractors on the Project. The Contractor shall defend and hold harmless the Owner, Construction Manager, and Architect for any claims, losses or delays of any kind whatsoever made by other Prime Contractors or Separate Contractors arising from delays caused by the Contractor.

§ 3.10.4 The Contractor shall perform the Work in accordance with the most recent project construction schedule submitted to and approved by the Owner and Construction Manager.

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§ 3.10.5 The Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operations of other contractors or of the Owner's premises or any of the Owner's operations. The Contractor shall, upon the Owner's request, schedule any portion of the Work affecting other contractors or the operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling, or performance of the Work under this Section 3.10.5 may be grounds for an extension of the Contract Time, if permitted under Section 8.3, but not an increase in the Contract Sum.

§ 3.10.6 Progress payments to the Contractor shall not occur until the Contractor has met the requirements of schedule information stated in this Section 3.10 and the Contract Documents.

§ 3.11 Documents and Samples at the Site

§ 3.11.1 The Contractor shall maintain and make available, at the Project site, one copy of the Contract Documents, including Drawings, Specifications, Addenda, Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.2 The Contractor shall also update the Construction Manager's record set of drawings on a weekly basis, at a minimum, and more frequently as necessitated by the Work. Upon completion of the Work, Contractor shall certify that such record drawings accurately reflect all "as built" conditions for which the Contractor is responsible, after which the Construction Manager will deliver its record drawings to the Architect for submittal to the Owner.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Prime Contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action. The Contractor shall forward to the Architect a copy of the transmittal covering each such submittal.

§ 3.12.5.1 Except where otherwise specified or agreed by Architect, the Contractor shall submit all shop drawings, product data, samples, and similar submittals within forty-five (45) days of the Notice to Proceed. When such initial

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submittals are rejected or otherwise required to be corrected and resubmitted, Contractor shall transmit complying submittals promptly so as to avoid delay in the Work, and in any case within thirty (30) days after return of the initial submittal, unless otherwise agreed by the Architect. Notwithstanding these time requirements for submittals, submittals that are required for work on the critical path of the construction schedule shall be submitted earlier and in a timely manner so as not to delay the Work.

§ 3.12.5.2 The Contractor agrees that the Owner will be damaged in an undeterminable amount if submission of shop drawings, product data, samples, and similar submittals is not made in compliance with Section 3.12.5.1.

§ 3.12.5.3 The Owner reserves the right to deduct $800 per day, as liquidated damages, and not as a penalty, until all such required submittals have been respectively and accordingly transmitted.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. Where applicable law and/or the Contract Documents require that Contractor engage a licensed design professional to provide a service, Contractor shall employ a professional possessing the required license in order to perform the service required.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate

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action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.12.11 Shop drawings, product data, and samples shall be submitted in quantity and procedures as directed by the Architect. It shall be the responsibility of each Prime Contractor to prepare and furnish to other Prime Contractors engaged on the Project, copies of shop drawings as may be required by such other Prime Contractors for the proper installation of their Work. Failure of the Contractor to furnish such information will make him responsible for any other expenses incurred in carrying out the provisions of such other Prime Contracts.

§ 3.12.12 Under no circumstances shall the Construction Manager, Architect, or Engineer's review of any shop drawing be construed as an approval of extra cost to the Owner for any work shown thereon. Any claim for extra cost shall be made as specified before the time of submitting shop drawings.

§ 3.12.13 All expenses incurred in delivering, transporting, packing, collecting, etc., of samples of materials or equipment shall be paid for by the Contractor, whether samples be delivered to the Project site, to the Architect, or to the laboratory. The cost of mill, fabrication, shop testing, or factory testing and inspection of all material required to be furnished under this Contract shall be borne by the Contractor. Any sample destroyed in the course of testing cannot be returned to the Contractor. Certain approved material, such as hardware, valves, fittings, fire alarm signals, in good condition and not subject to destructive tests, may be used in the Work by the Contractor. This material shall be the last of its particular kind to be incorporated in the building and may not be removed from the Architect's office until just previous to its use. Any material delivered to the job will be compared with the approved sample on file in the Architect's office and if necessary, an additional test shall be made on this material at the cost of the Contractor. Additionally, if a Contractor's shop drawing or other submittal requiring approval of the Architect requires review by the Architect more than three times, then the Contractor shall be responsible to the Owner and the Architect for any costs or expenses associated with reviews beyond the third review.

§ 3.12.14 To better facilitate the shop drawings process, copies of Floor Plan Backgrounds will be made available in electronic format to all Prime Contractors subject to the following provisions:

.1 The Contractor shall execute and submit the release and indemnification provided and requested by the Architect, Construction Manager, or Consultants.

.2 The data contained in any and all electronic files is copyright protected by the Architect and shall be used solely for the facilitation of the shop drawing process on this Project only. Any other use that is not consistent with this intended use is strictly prohibited. Any misuse will be punishable to the fullest extent of the law.

.3 Electronic media will only be made available to Prime Contractors. Direct requests from Subcontractors will not be honored. Prime Contractors shall bear the responsibility of distribution to their Subcontractors, if desired. Requests shall be made in writing directly to the Architect and shall indicate the list of drawings requested (indicate by drawing number). Drawings will be provided in .dwg format and issued electronically.

.4 The Prime Contractor shall thoroughly check all information and details of the Drawings and be satisfied that all information and details are correct. Information concerning existing conditions, if applicable, shall be thoroughly field checked and verified. Incorrect information and details shall immediately be called to the attention of the Architect. **Please note that Addenda information will not be included on the electronic files.** The Prime Contractor shall be responsible for incorporating all pertinent Addenda information.

.5 The Owner, the Construction Manager, the Architect, and the Architect's Consultants shall not be held responsible for any costs or other liabilities resulting from the use of electronic files or the failure of the Prime Contractor to detect errors and omissions concerning matters within its contractual responsibility through the use of said electronic files. The Prime Contractor shall indemnify, defend, and hold harmless, to the fullest extent permitted by law, the Owner, the Construction Manager, the Architect, and the Architect's Consultants, their directors, officers, agents, and employees from and

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against any and all claims, damages, losses and expenses, including attorney's fees arising out of the modification, misinterpretation, misuse of the electronic files, and for any and all errors or omissions alleged to have arisen out of the use of any electronic files.

.6 Nothing herein contained shall be construed as constituting a guarantee, warranty, or assurance, either expressed or implied, by any party, that the electronic files will yield or accomplish the Prime Contractor's desired outcome.

§ 3.13 Use and Protection of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.1.1 If requested by Owner or Construction Manager, Contractor shall move materials from one temporary location shown on the Contract Documents to another, at the sole expense of Contractor, except that expense shall be borne by Owner when Owner requires that materials be moved from a location on the Contract Documents previously assigned to Contractor by Owner. No advertising signs of any nature shall be placed at or near the site, without the written consent of Owner. Owner may make use of any portions of the Work for which a Certificate of Substantial Completion has been accepted in writing by Owner and Contractor.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site. The Work shall be conducted so as not to impede vehicular or pedestrian traffic nor obstruct any thoroughfare or access to the site or adjacent property, and so as not to interfere with the Work of other contractors or with the Owner's continued occupancy and operation of the property. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work or (2) the structure in the event of partial occupancy, as more specifically described in Paragraph 9.9.

§ 3.13.3 Only materials and equipment which are to be used directly in the Work may be brought to and stored on the Project site by the Contractor. Materials or equipment no longer required for the Work shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and/or all other adversity is solely the responsibility of the Contractor, and the Owner shall have no liability therefor.

§ 3.13.4 During the progress of the Work, the Contractor shall provide lights, barriers, warning signs or other prudent precautions as may be necessary to protect persons and property from the Work performed by the Contractor.

§ 3.13.5 The Contractor shall protect the Owner's property, all surrounding public and private properties, the Contractor's Work in place, and all the Work of Separate Contractors of other Prime Contractors against damage, injury or loss arising in connection with the Contractor's Work.

§ 3.13.6 The Contractor shall, at all times, provide adequate protection of the Work against all kinds of weather so as to maintain all Work, apparatus, and fixtures free from injury or damage. At the end of each day's work, all new work subject to potential damage shall be completely covered.

§ 3.13.7 The Contractor shall maintain all passageways, guard fences, lights, fire watch, and other facilities for protection necessary for compliance with applicable laws or otherwise required by authorities have jurisdiction.

§ 3.13.8 To the extent the Contractor is responsible for damage to any existing improvements or vegetation, including, without limitation, curbs, sewers, utilities, sidewalks, drainpipes, structures, lawns, shrubbery, trees, landscaping, hardscaping or other improvements at the site, the Contractor shall repair, restore, or replace such damaged improvements or vegetation to the Owner's reasonable satisfaction.

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§ 3.13.9 In case any direct or indirect injury is done to existing street or underground structure, sewers, mains, or to public or private property of any kind, or to any materials or fixtures, by or because of the Work in consequence of any act or omission on the part of the Contractor, its employees, or agents, the Contractor, at its own cost and expense, except where, hereinafter specified otherwise, shall restore such structures, property, or materials to a condition equal to or similar to the existing before such damage or injury was done, by repairing, rebuilding, or otherwise as may be required by the Architect. To the extent that the Contractor fails or refuses to meet the requirements of this Section and such failure and/or refusal results in the Owner incurring additional attorney's fees, professional fees, other costs or expense, the Contractor shall be liable for the same.

§ 3.13.10 If the Contractor fails to restore such property or make good such damage, the Owner may, by contract or otherwise, proceed to repair, rebuild, or otherwise restore such property as may be necessary, and the cost thereof will be deducted from any money due, or to become due, the Contractor under this Contract; or the Owner may deduct from any money due the Contractor a sum sufficient to reimburse the Owner of property so damaged.

§ 3.13.11 When the Contractor is working within a fully enclosed building with either temporary or permanent doors, the Contractor shall suitably lock the building to prevent access of unauthorized persons.

§ 3.13.12 All temporary shoring, bracing and sheet piling necessary for the underpinning and for the installation of new Work are included in the Contract Sum and shall be used in accordance with industry standards.

§ 3.13.13 Employees of the Contractor and is Subcontractors shall not park automobiles on the Owner's property except as approved by the Owner in writing or otherwise designated in the Drawings. Contractor shall direct and require all its employees and Subcontractors' employees to park where required by the Contract Documents and the municipal authority.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Prime Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Prime Contractors, Construction Manager, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.14.3 The Contractor, Subcontractor or Sub-Subcontractor requiring the cutting of openings in new Work installed by other Contractors shall have such openings cut and patched by the trade which installed the Work and such cutting and patching shall be at the expense of the Contractor, Subcontractor or Sub-Subcontractor requiring the opening. Approval to do such cutting and patching shall be received from the Construction Manager and the Architect prior to proceeding with the Work and shall include installation of such reinforcement of the Work as the Architect and the Construction Manager may direct at no additional cost to the Owner. Blocking, bracing, reinforcement, or structural enhancement required, due to cutting and patching, shall be provided at no additional cost to the Owner. Patching work shall match adjacent existing work unless otherwise noted.

§ 3.15 Cleaning Up

§ 3.15.1 The General Contractor is responsible for all clean-up, trash cans, and dumpsters. The General Contractor shall employ adequate general laborers (minimum of 2) on site at all times specifically to clean-up, place debris and trash in dumpsters, and maintain the Project free of all debris with the expectation of broom swept floors at end of each day. The General Contractor shall keep the premises and surrounding area free from accumulation of waste materials, dirt, debris, and rubbish caused by operations of all trades. At Substantial Completion of the Work, the General Contractor shall remove waste materials and rubbish from the Project site. Each Contractor shall be responsible for removing its own tools, construction equipment, machinery, and surplus materials from and about the

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Project. If the Construction Manager directs the General Contractor to clean an area, the General Contractor shall do so within twenty-four (24) hours. In the event of a dispute between or among the Prime Contractors regarding responsibilities for cleaning up, the Construction Manager shall designate the relative responsibilities, and such designation shall be final and binding.

§ 3.15.1.1 Eash Contractor is responsible to maintain and police its own break areas and staging areas to keep them clean and free of rubbish at all times and may utilize the dumpsters provided by the General Contractor for this purpose.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 In readiness for occupancy of the Owner, the General Contractor, when directed by the Architect, shall thoroughly clean all portions of the Work to be occupied and all applicable material and equipment surfaces suitable for occupancy. Cleaning of windows and other glass in the Project is a contractual requirement of the Contractor.

§ 3.15.4 The General Contractor shall make provisions for and be personally responsible for removing all mud and debris from all vehicles and equipment leaving the construction site onto Municipal streets adjoining the Project site and shall remove any mud, debris and litter which may fall upon Municipal streets or adjacent properties. If the same is not removed and properly washed down within 24 hours after verbal notice from the Municipality or the Owner then in that event, said mud, debris and litter shall be removed from the street by the Owner at the Contractor's expense.

§ 3.15.5 The General Contractor shall be responsible for managing and coordinating all policing and clean-up operations. The General Contractor shall permit no accumulations of any sort.

§ 3.15.6 Final Clean-Up: The General Contractor has the responsibility for the final clean-up and policing of the entire site after other Contractors have removed their own equipment and tools In addition thereto, the General Contractor shall perform or have performed the following immediately prior to the Architect's inspection for Substantial Completion:

- **.1** Removal of all manufacturers' temporary labels from materials, equipment, and fixtures.
- **.2** Removal of all stains from glass and mirrors; wash, polish, inside and outside.
- **.3** Removal of marks, stains, fingerprints, other soil, dust, dirt, from painted, decorated, or stained woodwork, plaster or plasterboard, metal, acoustic tile, and equipment surfaces.
- **.4** Remove spots, paint, soil, from resilient flooring.
- **.5** Remove temporary floor protections; clean, wax, or otherwise treat as directed, polish all finished floors. Final vacuum all carpet.
- **.6** Clean all interior finished surfaces, including doors and window frames, and hardware required to have a polished finish, of oil, stains, dust, dirt, paint, and the like; leave without finger prints, blemishes.
- **.7** Final site clean-up shall extend beyond the Contract Limit Lines as reasonably required to insure the complete removal of all construction debris from the entire site, including staging areas.

§ 3.16 Access to Work

§ 3.16.1 The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.16.2 The General Contractor shall perform snow plowing, cleanup, and provide all temporary facilities to keep the site accessible at all times and to permit the continuous progress of work by all Contractors.

§ 3.16.3 The Contractor shall promptly notify the Construction Manager, Architect/Engineer, and Owner of the presence of hazardous conditions at the site, including the start of hazardous operations or the discovery or exposure of hazardous substances.

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§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, and Architect, and their officers, directors, consultants, agents, and employees (the "Indemnified Parties") from and against all claims, damages, losses and expenses, including but not limited to injuries to the Contractor's employees, legal fees, and defense costs, arising out of or resulting from the performance of the Work to the extent caused, in whole or in part, by the negligent acts or omissions of the Contractor, a Subcontractor, a Sub-subcontractor or material provider, anyone directly or indirectly employed by them, or anyone for whose acts or omissions they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by the Indemnified Parties or any of them. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations for indemnity which would otherwise exist as to a party or person described in this Section 3.18. The Contractor agrees and does hereby assume on behalf of the Indemnified Parties the defense of any action, at law or in equity, which may be brought against the Indemnified Parties or any of them upon their demand and pay the amount of any judgment that may be entered against the Indemnified Parties in any such action. In the event that any such claim, loss, cost, expense, liability, damage or injury arises or is made, asserted or threatened against the Owner for which the Contractor or its insured does not admit coverage, or if the Owner reasonably determines such coverage to be inadequate, the Owner shall have the right to withhold from Contractor cost, expense, liability, damage or injury including, but limited to, legal fees and expenses reasonably necessary for the defense thereof. Contractor's obligations under this Section 3.18 shall survive the completion of the Work and Project.

§ 3.18.2.1 In claims against any Indemnified Party under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under this Section 3.18 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts or any immunity provided under any workers' compensation acts.

§ 3.18.2.2 The Contractor and each Subcontractor, of whatever tier, hereby certifies to the Owner that it complies with all employment related laws and regulations governing employment or collective bargaining agreements, if any. Nothing in this Agreement shall be construed as divesting any Contractor of Subcontractor of its sole and exclusive right to control the means, manner, or method of performance of the Work by their employees. Nothing in this Agreement shall be construed in a manner that would be violative of the legal or contractual rights of any employee. The Contractor, and each Subcontractor, regardless of tier, shall defend, hold harmless, and indemnify the Owner, Construction Manager, and Architect against and from any and all claims, demands, suits, actions, costs, and expenses including reasonable attorneys' fees, growing out of any claims by an employee or independent contractor of any Contractor or Subcontractor of any tier alleging the violation of any of the individuals' employment right, whether legal, constitutional or contractual in nature. This provision shall be accorded the broadest meaning permitted by law.

§ 3.18.3 Each Contractor shall indemnify, defend, and hold harmless the Owner against any assertion of claims and/or liens, including mechanic's liens by its Subcontractors, Sub-Subcontractors, or material suppliers and against any assertion of security interests by its suppliers of goods or materials. Each Contractor and each Subcontractor and supplier of any tier acknowledges that the Project is work for a purely public purpose; therefore, Pennsylvania law does not permit mechanics' liens to be filed against the Owner, the Property, the Project, or any portion thereof.

§ 3.18.4 No provision of Section 3.18 shall give rise to any duties on the part of the Architect, the Owner or the Construction Manager not otherwise provided for by law.

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§ 3.18.5 In the event that Contractor or its insurer is requested but refuses to honor the defense and indemnity obligations hereunder, then the party refusing to honor such requests shall, in addition to all other obligations, pay the cost of bringing any such action, including, but not limited to, legal fees to the Indemnified Party, including, but not limited to, any legal fees and costs incurred by the Indemnified Parties in enforcing the defense and indemnity obligations hereunder. Furthermore, the Contractor shall be solely responsible for all legal fees incurred by the Owner in responding to any claims or liens filed or asserted by a Subcontractor of any tier or a supplier of any tier.

§ 3.18.6 Any part of the Work which may cause contamination or pollution to the environment shall be performed by subcontractors who are properly certified to do such work and who normally carry contractually assumed indemnification insurance and public liability insurance to cover such Work in the amount required to be carried by Contractor for liability and contractually assumed liability coverage under this Contract.

§ 3.19 Representations and Warranties

§ 3.19.1 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute the Owner-Contractor Agreement, which representations and warranties shall survive the execution and delivery of the Owner-Contractor Agreement and the Final Completion of the Work:

- **.1** that it is financially solvent, able to pay its debts as they mature and possesses sufficient working capital to complete the Work and perform its obligations under the Contract Documents.
- **.2** that it is able to furnish the personnel, tools, materials, supplies, equipment, and labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so.
- **.3** that it is authorized to do business in the Commonwealth of Pennsylvania and is properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work for the Project.
- **.4** that its execution of the Owner-Contractor Agreement and its performance thereof is within its duly authorized powers.
- **.5** that it is familiar with all Federal, State, Municipal, and Department laws, ordinances, and regulations, which may in any way affect the Work of those employed herein, including, but not limited to, any special acts relating to the Work or to the Project of which it is a part.
- **.6** that it has determined what local ordinances, if any, will affect its Work. The Contractor has checked for any County, City, Borough, or Township rules or regulations applicable to the area in which the Project is being constructed and in addition, the Contractor has checked for any rules or regulations of other organizations having jurisdiction, including, but not limited to, chambers-of-commerce, planning commission, industries, or utility companies who have jurisdiction over lands which the Contractor occupies. Any costs of compliance with local controls are included in the Contract Sum, even though documents of such local controlling agencies are not listed herein.
- **.7** that such temporary and permanent Work required by the Contract Documents as is to be done by it, can be satisfactorily constructed and used for the purposes for which it is intended, and that such construction will not injure any person or damage any property.
- **.8** that it is familiar with local trade jurisdictional practices.
- **.9** that it has carefully examined the Plans and Specifications and that, from its own investigation, it has satisfied itself as to the nature and location of the Work, the character, quality and quantity of the surface and subsurface materials likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, and the general local conditions, and all other materials which may in any way affect the Work or its performance.
- **.10** that it is insurable in the Commonwealth of Pennsylvania.

§ 3.20 The Contractor agrees (in addition to the representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute the Contract, that the Contractor shall be restricted to the rights and remedies set forth in Article 15 of these General Conditions with respect to Claims between the Contractor and the Owner. However, the Owner's right to recover under the Contract Documents, at law or in equity shall not be restricted to the rights and remedies set forth in Article 15 of these General Conditions. This Section 3.20 shall survive the expiration or sooner termination of the Contract.

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§ 3.21 Record Drawings

Contractor shall prepare and provide a set of reproducible record drawings showing significant changes in the Work made during construction based on marked-up prints, drawings and other data furnished by the Contractor to the Architect, including, but not limited to, the location of water, sewer, telephone, electric, gas and any other utility lines, and the Contractor shall certify these drawings as accurate. Said drawings shall be provided by the Contractor to the Architect prior to final payment by Owner to Contractor.

§ 3.22 Owner's Manuals

Contractor shall turn over to Architect, for delivery to Owner, all operation manuals, maintenance instructions, and warranties for all equipment prior to final payment by Owner to Contractor.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment, and with the Owner's concurrence, from time-to-time during the warranty or correction period for correction of the Work described in Section 12.2. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents. The Architect and Construction manager will endeavor to guard the Owner against defects and deficiencies in the Work on the Project. The Owner has hired Construction Manager to provide onsite Project Management services. Construction Manager will be the Owner's Representative for this Project. Construction Manager and the Architect will share administration duties, which will be delineated at the pre-construction meeting. Construction Manager will be the primary point of contact and will defer to the Contractors for means and methods and to the Architect for final clarifications and determinations of disputes, design issues, and aesthetics.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with and keep the Owner informed about the progress and quality of the portion of the Work completed, to guard the Owner against defects and deficiencies in the Work, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract

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Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 The Construction Manager will observe the activities of the Contractor and inform the Architect and Owner of any deviations from the latest approved construction schedule. The Project Coordinators shall schedule and coordinate the activities of the Contractor and other Prime Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Prime Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect if those communications are about matters arising out of or related to the Contract Documents. Communications by and with the Owner's own forces and Separate Contractors shall be through the Construction Manager.

§ 4.2.7 Based on the Construction Manager's and Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Owner, Architect and Construction Manager have the authority to reject Work that does not conform to the Contract Documents and will notify each other about the rejection. Whenever the Owner or Construction Manager considers it necessary or advisable, the Owner or Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed, or completed. The foregoing authority of the Owner and Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor Owner's nor Construction Manager's authority to act under this Section 4.2.8 nor a decision made by any of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect, Owner, or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Intentionally deleted.

§ 4.2.10 The Construction Manager shall coordinate with the Prime Contractors the distribution of the submittals required by the Contract Documents for review by the Architect. The Construction Manager will require that the Prime Contractors coordinate all submittals so as to integrate the Work of other Prime Contractors and Separate Contractors. All Prime Contractors must review the submittals of other Prime Contractors to determine how the Work affects the Contractors' planned Work and also to coordinate and schedule all required Work. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Architect, and Construction Manager that the Contractor has reviewed and recommended them for approval. The actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect. The Construction Manager is not responsible for any design aspects of the Project, and therefore, the

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Construction Manager's submittal responsibility shall be limited to coordinating the procedure of submittal processing with the Architect and Prime Contractors.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor, other Prime Contractors, or other Separate Contractors while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager. A copy of each submittal which has been approved shall be forwarded by the Architect to the Contractor and Construction Manager for its records. For any submittal which is not approved, the Contractor and Construction Manager shall be sent only a copy of the covering transmittal and pertinent portions of the unapproved submittal.

§ 4.2.11.1 Architect's action on Shop Drawings will result in one of five notations on them, namely, NO EXCEPTION TAKEN, REVISE AND RESUBMIT, REJECTED/RESUBMIT, FURNISH AS CORRECTED or FURNISH AS CORRECTED/RESUBMIT. Such notations do not extend the responsibilities of the Architect beyond those described in 4.2.11.

§ 4.2.11.2 In no case will the Architect's review period on any submittal be less than fourteen (**14)**days after receipt of the submittal form the Contractor.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager and Architect will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor. The Construction Manager will forward to the Architect a final Application for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 Intentionally deleted.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction

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Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. However, the Architect shall not have the authority to bind the Owner to accept Work to which the Owner objects as being deficient or otherwise inconsistent with the Contract Documents. The Contractor shall be responsible for the Architect's fees and expenses by responding to Requests for Information where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor provided coordination drawings, or prior Project correspondence or documentation.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the language and intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. Interpretations of Contract Documents, to be effective for claim purposes or for justification as to proper procedure in performing the Work, must be obtained in writing before such claim is made or such Work begun.

§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents, and if approved by the Owner.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor and forward each request for information to the Architect and Owner, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Architect's response to such requests will be made within 14 days unless the Architect determines additional time is required. If the Architect determines additional time is required, the Architect will inform the Owner and Contractor, in writing, of the additional time needed. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information at no additional cost to the Owner.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Prime Contractors or Separate Contractors or the subcontractors of other Prime Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor or other Sub-subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 No later than thirty (30) days after the date of the Notice to Proceed, the Contractor shall, as stated below, notify in writing to the Construction Manager, for review by the Owner, Construction Manager and Architect, the name, trade and subcontract amount for each Subcontractor, persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. In all cases, this notification shall be received in writing no less than seven (7) days prior to a Subcontractor starting Work. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection. The Architect will promptly reply in writing to the Contractor stating whether the Owner or Architect, after due investigation, has reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Architect may state that action will be deferred until the Contractor provides further data. Failure of the Owner or Architect to reply promptly shall not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements.

§ 5.2.1.1 Not later than 30 days after the date of the Notice to Proceed, the Contractor shall furnish in writing to the Owner through the Construction Manager the names of persons or entities proposed as manufacturers, fabricators or

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material suppliers for the products, equipment and systems identified in the Project Specifications and Drawings and, where applicable, the name of the installing Subcontractor. The Construction Manager and Owner reserve the right to deduct $800.00 from the Contract Sum, as liquidated damages and not as a penalty, for each additional day that all information is not furnished in addition to all other remedies provided for herein.

§ 5.2.1.2 Not later than 60 days after the date of the Notice to Proceed, the Contractor shall furnish proof in writing (if requested) that all subcontracts and purchase orders for all work in the Project Specifications have been executed. The Construction Manager and Owner reserve the right to deduct $800.00 from the Contract Sum, as liquidated damages and not as a penalty, for each day that any portion of Work has not been contracted for in addition to all other remedies provided for herein.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection; however, no increase in the Contract Sum or Contract Time shall be allowed for and such substitution.

§ 5.2.3.1 No approval or disapproval by the Architect, Construction Manager or Owner of any particular Subcontractor shall relieve Contractor of its responsibility for performance of the Work. Furthermore, Contractor is not relieved of its responsibility for Contractor's selection of particular processes or materials for the performance of the Work by any Owner, Construction Manager or Architect approval of a particular Subcontractor.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.2.4.1 The Contractor shall also require each Subcontractor to submit a list of any proposed sub-subcontractors and suppliers for Construction Manager's review and approval pursuant to the same process detailed in section 5.2.1 above, and Contractor shall not permit Subcontractor to delegate, or further subcontract to others the performance of any of its obligations or work required or contemplated by their Subcontract without prior written consent of the Construction Manager, which shall not be unreasonably withheld.

§ 5.2.5 Upon request, the Contractor shall furnish the Owner, Construction Manager and Architect with (3) copies of any and all agreements by, between and among the Contractor and each Subcontractor along with all documentation related to such agreements. The Contractor shall name the Owner as a third-party beneficiary of each Subcontract and, whether written in such subcontract or not, each Subcontractor, having received and reviewed these General Conditions as evidenced by its execution of the subcontract, agrees that Owner shall be a third-party beneficiary of its subcontract.

§ 5.2.6 Promptly upon execution of a subcontract, Contractor shall provide the Owner true, accurate and complete copies of all subcontracts and material supply contracts.

§ 5.3 Subcontractual Relations

§ 5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically

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provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.2 Where Contractor sublets portions of the Work, the entire responsibility for the subdividing of work rests with the Contractor. The Owner and the Architect are not responsible for the manner of the subdivision of the Work, and neither will enter into nor settle disagreements or disputes between Contractor and Subcontractors. The arrangement of Specifications and the manner of graphic illustration of Drawings are for convenience of reference and do not comprise any exacting method of subdividing work for purposes of subcontracting, except where the Contract Documents require an undivided responsibility for certain work.

§ 5.3.3 Contractor shall require each Subcontractor to: (1) inspect surfaces and job conditions before beginning Work at Site, (2) accept or cite necessary corrections in surfaces and job conditions before beginning work at Site, and (3) protect its own materials, equipment and Work from damage, injury or loss due to weather or due to Work of the Contractor, other Subcontractors, or other Contractors. The best means of protection shall be supplied and removed when no longer required.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

Except as set forth in Section 5.4.3 hereof, when the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract accruing on or after the date of assignment.

§ 5.4.2 The Contractor agrees, upon Owner's request, to execute whatever instruments Owner may require to confirm such assignment.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity, and in such case, the successor contractor or other entity and not the Owner shall assume the Contractor's rights and obligations under the subcontract accruing on or after the date of assignment.

§ 5.4.4 Each subcontract shall specifically provide that the Owner shall only be responsible to the Subcontractor for those obligations of the Contractor that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

§ 5.5 Payments to Subcontractors or Material Supplier(s) by the Contractor

§ 5.5.1 The Contractor shall pay each Subcontractor, upon receipt of payment from the Owner, an amount equal to the percentage of completion allowed to the Contractor, on account of such Subcontractor's work, less the percentage retained from payments to the Contractor. The Contractor shall also require each Subcontractor to make similar payments to Sub-Subcontractors. All such payments shall be paid within the time limits required by the Pennsylvania Commonwealth Procurement Code, 62 Pa.C.S. §3933, and all other applicable legal requirements. In the event a Subcontractor or material supplier alleges that the Contractor has failed to pay it in full, the Owner may, in addition to its other rights, set off said amounts from any amount due and owing to the Contractor.

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§ 5.6 Payments to Subcontractors by the Owner

§ 5.6.1 If the Owner fails to approve an Application for Payment for a cause which the Owner and Architect determine is the fault of the Contractor, and not the fault of the particular Subcontractor, or if the Contractor fails to make payment which is properly due to a particular Subcontractor, the Owner may pay such Subcontractor directly, less the amount to be retained under its Subcontract. In such case, the amount(s) paid by the Owner to such Subcontractor shall be deducted by Change Order from the Contactor's Contract Sum.

§ 5.6.2 The Owner shall have no obligation to pay, or to see to the payment of, any monies to any Subcontractor or material supplier. Nothing contained in Section 5.6.1 shall be deemed to create any contractual duty of the Owner to any Subcontractor of any tier or Supplier of any tier or to create any rights in any Subcontractor of any tier or Supplier of any tier against the Owner.

§ 5.6.3 The Contractor shall promptly advise the Owner and the Architect of any claim or demand by a Subcontractor claiming that any amount is due to such Subcontractor claiming any default by the Contractor in any of its obligations to such Subcontractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. This Project will be performed with Multiple Prime Contractors as indicated in the Contract Documents. The Contractor shall be aware that schedule adjustments will be required to coordinate with the Work of their Contract with the Work of other Prime Contractors.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Contractorshall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them. When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts administered by the Construction Manager, the Construction Manager shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. Should the Contractor's portion of the Work be damaged by any other Contractor or Separate Contractor by reason of such other Contractor or Separate Contractor's failure to perform properly its Contract with the Owner, no action will lie against the Owner, and the Owner shall have no liability therefore. The Contractor's sole remedy shall be to assert its claim for damage against such other Contractor or Separate Contractor.

§ 6.2.2.1 None of the Owner, the Construction Manager, and/or the Architect shall be responsible for the coordination of the Contractor's Work. Coordination of the Contractor's Work shall be governed by the Contract Documents.

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§ 6.2.2.2 Each Prime Contractor shall be responsible for the coordination of their own Work with the other Prime Contractors, and for observing the requirements set forth in Division 01. The coordination of mechanical, electrical, and plumbing Work shall also be subject to the responsibility of the Project Coordinator in connection with the rendering of final construction decisions. Such responsibility shall however be invoked only after the provisions of Division 01 have been fully observed.

§ 6.2.3 Costs caused by delays, improperly timed activities or defective construction shall be borne by the parties responsible therefore, excepting, however, Owner, Architect, and Construction Manager shall not be liable to any Contractor or Subcontractor for claims or damages of monetary or other nature caused by or arising out of delays of other Contractors or Separate Contractors, contemplated, or not contemplated. The sole remedy against the Owner for delays shall be the allowance to a successful claimant of additional time for completion of the Work. If, notwithstanding the above, the Owner is required to reimburse a Separate Contractor because of delays, lack of performance, improperly timed activities, or defective construction of the Contractor that failed to perform, then the Contractor responsible for the delay, lack of performance, improperly timed activities, or defective construction that Contractor shall then reimburse the Owner for the costs incurred by the Owner which are payable to the Separate Contractor because of delays, improperly timed activities, or defective construction of the Contractor. If the Contractor asserts a claim against the Owner, Architect, or Construction Manager in violation of the foregoing provisions, the Contractor shall, in addition to all other relief that is afforded, reimburse the Owner, Architect, and Construction Manager for its reasonable costs and attorney's fees. In the event that a Separate Contractor makes a claim or demand upon the Owner, the Architect and the Construction Manager, or any of them (notwithstanding that such claim or demand is in violation of such Separate Contractor's Contract for Construction with the Owner) for or on account of any actual or alleged act, omission, fault or breach of the Contract, by the Contractor, the Contractor shall indemnify and defend any and all of them from such claim or demand.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Prime Contractors as provided in Section 10.2.5. The Contractor agrees to defend, indemnify, and hold harmless the Owner, Construction Manager and Architect and the consultants, agents and employees of any of them from and against any claims or damages brought by a Prime Contractor or Separate Contractor arising out of actions or omissions of the Contractor, or its Subcontractors, Sub-subcontractors, or suppliers, in performing its Work under the Contract Documents. Should the Contractor wrongfully cause damage to the Work or property of any other Contractor or Separate Contractor, the Contractor shall, upon due notice, promptly attempt to settle with the other Contractor or Separate Contractor by agreement, or otherwise to resolve the dispute. Such dispute shall not delay the completion of the Work. A Contractor claiming damages at its expense subject to its right to recover damages shall continue Work. If such other Contractor or Separate Contractor sues the Owner, the Architect, or Construction Manager on account of any damage alleged to have been caused by Contractor, the Owner, Architect or Construction Manager shall notify the Contractor, who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner, Construction Manager, or Architect arises therefrom, the notified Contractor shall pay or satisfy it and shall reimburse the Owner, Construction Manager, or Architect for all attorneys' fees and court costs which the Owner, Construction Manager, or Architect has incurred.

§ 6.2.5 The Owner, Separate Contractors, Prime Contractors, and other contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.2.5.1 Should the Contractor, either itself or by its Subcontractors or Sub-Subcontractors or their respective agents, servants, or employees, cause damage or injury to the property or Work, including, but not limited to Work performed by Contractor, Subcontractors, other Prime Contractors or their Subcontractors, or by failing to perform its Work (including, without limitation, the Work of its Subcontractor or Sub-Subcontractors) with due diligence, delay any Contractor, Subcontractors, other Prime Contractors or their subcontractors, which suffer additional expense or damage as a result, the parties involved in such dispute and their respective Sureties shall settle by agreement or arbitrate said claim, dispute or action by referring same to the American Arbitration Association. Said claim, dispute or action shall be determined pursuant to the Construction Industry Arbitration Rules of the American Arbitration Association then in effect. The Contractor and Subcontractors agree that the Owner, Architect, and Construction Manager will not be a party to disputes or actions between or among Prime Contractors, the Sureties or Subcontractors concerning such additional expense or damage. It is agreed by all parties that claims, disputes or actions between or

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among Contractors, Sureties, and Subcontractors concerning the additional expense or damage will not delay completion of the Work, which shall be continued by the parties, subject to the rights hereinbefore provided. It is agreed by the parties to this Agreement (the Owner as promisee and the Contractor as promisor) that the intent of this clause is to benefit all Prime Contractors, Subcontractors, and their Sureties on the Project and to serve as an indication of the mutual intent of the Owner and the Contractor that this clause raise the Prime Contractors to the status of third-party beneficiaries only as to the terms and conditions of this Section 6.2.5. The Contractor agrees that the paragraphs of this Section 6.2.5 are provided as a benefit to the Contractor and, that they specifically exclude claims, disputes or actions against the Owner, Architect, and Construction Manager for delay or other damages.

§ 6.2.5.2 The Contractor agrees that all claims, disputes, and other matters in question between or among Sureties, Contractor, Subcontractors, other Prime Contractors or their Subcontractors which arise out of, or are related to the Work, this Agreement, or the breach thereof, as provided in Section 6.2.5.1, shall be settled by agreement or resolved by arbitration, in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then in effect, unless the parties mutually agree otherwise. This agreement to arbitrate is in consideration of the fact that all other Prime Contractors agree to this same arbitration provision, as provided in each separate Prime Contract required for the construction of this Project and is specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in accord with applicable law in any court having jurisdiction thereof. Neither the Contractor, Surety nor a Subcontractor shall join the Owner, Architect, or Construction Manager as a party to such arbitration.

§ 6.2.5.3 Notice of the demand for arbitration shall be filed in writing with the other Prime Contractor(s) and with the Regional Office of the American Arbitration Association. A copy of the demand shall be filed with the Architect, Construction Manager, and the Owner. The demand for arbitration shall be made within thirty (30) days after the claim, dispute, or other matter in question has arisen. The Owner, Architect, and Construction Manager shall not be a party to the claim, dispute, or other matter in question, but shall be a witness in any arbitration at the request of any party to the arbitration; the requesting party shall reimburse Owner, Architect, and/or Construction Manager for their reasonable costs incurred for serving as a witness. The Owner will be provided with copies of all documents submitted to the arbitrator at no cost to the Owner.

§ 6.2.5.4 The Contractor and each of its Subcontractors (as evidenced by its acceptance of the subcontract) hereby agrees that the sole remedy for including, without limitation, injuries, damages, or expenses resulting from disputes between or among the Contractor, Sureties, Subcontractors, other Prime Contractors or their Subcontractors will be to seek recovery from the Contractor, Sureties, Subcontractors, other Prime Contractors or their Subcontractors for the transgressions of such other Sureties, Subcontractors, other Prime Contractors or their Subcontractors. The Contractor and each of its Subcontractors hereby further agrees that they shall have no recourse against the Owner, Architect or Construction Manager for the transgressions of Contractor, Sureties, Subcontractors, other Prime Contractors or their subcontractors that result in including, without limitation, delay, acceleration, out-of-sequence Work, overtime, stacking of trades, failure to adequately clean the work areas, disputes over the scope of the Contractor's Work, or disputes between or among Contractor, Sureties, Subcontractors, other Prime Contractors or their subcontractors regarding any other matter concerning the Project.

§ 6.2.5.5 The Contractor and each of its Subcontractors acknowledge that the restrictions contained in these General Conditions are reasonable and necessary in order to protect the legitimate interests of the Owner and that any violation of these General Conditions would result in irreparable injuries to the Owner and monetary damages would be inadequate to compensate the Owner for a violation of these General Conditions. Therefore, the Contractor and each of its Subcontractors hereby agree that if the Contractor or Subcontractor disregard any paragraph of these General Conditions, including, without limitation, any portion of this Article 6, and institutes or attempts to institute any proceeding (e.g., arbitration, litigation, mediation, etc.) against the Owner, Architect, or Construction Manager for including, without limitation, injuries, damages or expenses resulting from disputes between or among Contractor, Sureties, Subcontractors, other Prime Contractors or their Subcontractors, the Owner is entitled to obtain from any court of competent jurisdiction preliminary and permanent injunctive relief to prevent the Contractor or Subcontractor from pursuing any proceeding against the Owner, Architect, or Construction Manager, and the Owner is entitled to stay any such proceeding. In the event that the Owner pursues preliminary or permanent injunctive relief to prevent the Contractor from pursuing any proceeding against the Owner, Architect, or Construction Manager, or that the Owner attempts to stay any such proceeding, the Contractor and the Contractor's Surety shall be jointly and severally

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liable for reimbursing the Owner, immediately upon demand, for all of Owner's costs and expenses associated therewith, including, without limitation, all legal fees, professional fees, and all other costs associated therewith incurred by the Owner. In the event that the Owner pursues preliminary or permanent injunctive relief to prevent a Subcontractor from pursuing any proceeding against the Owner, Architect, or Construction Manager or that the Owner attempts to stay any such proceeding, the Subcontractor and the Subcontractor's Surety (if any) shall be jointly and severally liable for reimbursing the Owner, immediately upon demand, for all of Owner's costs and expenses associated therewith, including, without limitation, all legal fees, professional fees, and all other costs associated therewith incurred by the Owner. The Owner's rights set forth in this Section 6.2.5.5 shall be in addition to all other rights of the Owner granted in the Contract Documents, at law, or in equity.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Multiple Prime Contractors, and/or the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible as the Owner determines to be just, based on the recommendation of Construction Manager.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive, or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work after execution of a Change Order, Construction Change Directive, or order for a minor change in the Work, whichever occurs first.

§ 7.1.3.1 Notwithstanding anything contained in the Contract Documents to the contrary, a change in the Contract Sum, the Contract Time and/or any Milestone Date shall be accomplished only by Change Order or by a Constructive Change Directive. No course of conduct or dealing between the parties, no express or implied acceptance of alterations or additions of the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work shall be the basis of any claim or adjustment in compensation due under the Contract and/or time period provided for under the Contract. A directive or order from the Owner, Construction Manager, or the Architect, other than a Change Order, a Construction Change Directive, or order for a minor change pursuant to this Article 7, shall not be recognized as having any impact on the Contract Sum or the Contract Time and the Contractor shall have no claim therefore. If the Contractor believes that a directive or order would require it to perform Work not required by the Contract Documents, the Contractor shall so inform the Owner and Architect in writing prior to complying with the same and in no event any later than five (5) working days from the day such direction or order was given, and shall submit to the Owner and Architect for the Owner's and Architect's approval its request for a Change Order.

§ 7.1.3.2 Agreement on any Change Order shall constitute a final settlement of all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time. In the event a Change Order increases the Contract Sum, the Contractor shall include the Work covered by such Change Order in Applications for Payment as if such Work were originally part of the Contract Documents. Present or future claims by the Owner relating to defective performance of the Work shall not be deemed settled through agreement on a Change Order unless so expressly agreed in writing.

§ 7.1.4 Matters involving extra Work and changes in the Work are subject to the following provisions:

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§ 7.1.4.1 Owner reserves the right to accept or reject Contractor's price, and in instances of more than one price, to accept one or more prices, or reject one or more or all prices. Contractor may not make a charge of any kind regarding proposed extra Work or proposed changes in the Work that were not accepted.

§ 7.1.4.2 Contractor agrees that prices for changes in the Work and or extra Work will not include charges involving penalties or damages for assumed delays in the Work, charges for estimating, cancellation charges on prior rejected Work, and similar amounts which do not relate directly to costs of labor and material and equipment appurtenant to Work involved.

§ 7.1.4.3 A Change Order or Construction Change Directive will establish whether the Contractor is permitted extra time because of extra Work or changes in the Work and, if so, the amount of extra time permitted. Such determinations will be final and will not alter the fact that time is of the essence in the Contract.

§ 7.1.4.4 No charges by Contractor for extra Work or changes in the Work, nor claims on account thereof, shall be valid unless duly authorized pursuant to the procedure herein described. Written authority to perform extra Work or changes in the Work must be in possession of Contractor before such Work commences in order that Contractor's right to payment on account thereof may be valid.

§ 7.1.4.5 In order to facilitate checking of quotations for adjustments in the Contract Sum, all Change Order requests, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including, labor, materials, and subcontracts and the estimated impact on the construction schedule, based upon an impact analysis of the current schedule. Labor and materials shall be itemized in the manner prescribed herein. When major cost items are subcontracted, these costs shall be itemized also.

§ 7.1.4.6 All Change Orders shall be accompanied by detailed price breakdowns.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Section 7.2.5 or 7.3.3.

§ 7.2.3 To the extent the Contractor makes an excessive number of Change Order requests, which excessiveness, shall be determined solely in the discretion of the Owner, the Owner shall have the authority in its sole discretion, to disregard any subsequent Change Order requests made by such Contractor on the same or similar scope of services and the Contractor's sole remedy against the Owner under this Agreement shall be pursuant to Article 15 of these General Conditions. Furthermore, to the extent the Owner incurs any legal fees, professional fees, expenses, or costs (including, but not limited to, employee costs or the costs of Architect and/or Construction Manager), arising out of or resulting from the Contractor making an excessive number of Change Order requests, the Contractor shall be liable for such legal fees, professional fees, expenses, and costs.

§ 7.2.4 Any action(s) by the Owner, Construction Manager, Architect and/or the Contractor other than actions taken pursuant to the procedures set forth in Section 7.2.1 shall not constitute the approval of a Change Order, including, without limitation, the Owner's, Construction Manager's and/or the Architect's execution of the Contractor's time sheets upon which the Contractor submits a Change Order request. Furthermore, to the extent the Owner incurs any legal fees, professional fees, expenses, or costs (including, but not limited to, employee costs), arising out of or resulting from the Contractor's failure to follow the proper procedures for approval of a Change Order, the Contractor shall be liable for such legal fees, professional fees, expenses, and costs.

§ 7.2.5 At Owner's election, Change Order costs shall be calculated by the Contractor and each Subcontractor as follows:

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§ 7.2.5.1 Actual costs of labor, including social security and old age and unemployment insurance, fringe benefits and workers' compensation insurance associated with the Change in the Work (as calculated per Section 7.3.4).

§ 7.2.5.2 Actual costs of materials, supplies and equipment, including cost of transportation used in performing the Change in the Work.

§ 7.2.5.3 Actual rental costs of machinery and equipment rented from third parties, exclusive of hand tools; required by the Change in the Work, whether incorporated or consumed.

§ 7.2.5.4 Actual costs of premiums for all bonds and insurance and permit fees and sales, use or similar taxes related to the Change in the Work.

§ 7.2.5.5 For any adjustments to the Contract Sum (other than those based upon unit prices which include overhead and profit), the Contractor and each Subcontractor agree to charge and accept, as payment for overhead and profit, the following percentages of costs attributable to the addition, deletion or change to the Work.

.1 The allowance for overhead and profit, included in the total cost to the Owner, shall not exceed a combined total of fifteen percent (15%). Overhead and profit shall include the additional costs of supervision and field office personnel directly or indirectly attributable to the change. The Contractor shall limit its profit and overhead, when combined with that of its Subcontractors and Sub-subcontractors, to a total of fifteen percent (15%) of the value of the related Work. If the Work is paid for using a Contract allowance, the cost of overhead, profit, insurance and bonds is included in the allowance money.

.6 The charges for overhead and profit referred to herein shall include all claims and requests for payment by the Contractor of indirect and/or consequential costs and expenses of any kind arising out of the subject addition, deletion, or change to the Work or the effect of the addition, deletion, or change upon other Work or upon the scheduling progress or completion of other Work, including without limitation, home office overhead, field office overhead, and return of staff.

§ 7.2.5.6 For any adjustments to the Contract Sum (other than those based upon unit prices which include overhead and profit), the Contractor and each Subcontractor agree to charge and accept, as payment for overhead and profit, the following costs attributable to the addition, deletion or change to the Work.

.1 Costs of labor, including applicable payroll taxes such as social security, old age and unemployment insurance, fringe benefits required by agreement or custom, workers' compensation insurance (labor costs shall be the certified Base Prevailing Wage rate plus actual fringe benefits per the Prevailing Wage Determination Schedule included in the Project Manual plus FICA, SUTA, FUTA and Workmen's Compensation, and other employee costs approved by the Construction Manager and Architect;

.2 Costs of materials, supplies, and equipment, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented by the Contractor or others, exclusively when the required tools are not already on site; Contractor is not entitled to the cost of misc. tools, travel expense, additional supervision, or any other costs that are not directly associated with labor and materials required for the additional Work.

.4 Additional costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and all bonds and insurance, permit fees, and sales, use, or similar taxes directly related to the change shall be submitted without markup. Adjustment for bonds and insurance will be performed at closeout after reconciling the total cost of Change Orders; no adjustments for bonds and insurance will be considered for individual Change Orders before the final reconciliation.

.5 Costs of supervision and- field office personnel directly attributable to the change will not be permitted under any circumstance.

§ 7.2.5.7 All Change Orders shall be accompanied by detailed price breakdowns in the format as directed by the Construction Manager. Owner reserves the right to accept or reject Contractor's price. No charges by Contractor for extra Work or changes in the Work shall be valid unless duly authorized pursuant to the procedures described herein. Written authority from the Construction Manager and Owner to perform extra Work or changes in the Work must be in the possession of the Contractor before such Work commences if Contractor seeks payment on account

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of such Work. Contractor agrees that prices for changes in the Work and for extra Work will not include charges involving penalties or damages for assumed delays in the Work, charges for estimating, cancellation charges on prior rejected work or similar amounts which do not relate directly to costs of labor and material and equipment necessary for the Work involved in the Change Order. Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule.

§ 7.2.6 Unit Prices and their use in Contract Adjustments

§ 7.2.6.1 If Unit Prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such Unit Prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable Unit Prices shall be equitably adjusted.

§ 7.2.6.2 Approved Unit Prices, when accepted by the Construction Manager and Owner, shall be used where they apply to determine an equitable adjustment of the Contract Sum in connection with extra Work or changes ordered under the Contract. Approved Unit Prices shall apply to both additions to and deductions from the Contract Sum.

§ 7.2.6.3 Unit Prices submitted by a Contractor on the Bid Form for this Project shall include all profit, overhead, bonds, insurance, taxes, labor, materials, plant equipment and tools necessary and required to fully complete the Work item, as specified in detail for the Work item in the Contract Documents.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect]and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be allocated based on the approved Schedule of Values and based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.2.5.5 and which includes, without limitation, Contractor's obligations under these General Conditions and Division 01 of the Specifications. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to those listed in Section 7.2.5.6.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Owner, Architect, and Construction Manager of the Contractor's agreement or

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disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time. Notwithstanding anything else to the contrary in the Contract Documents, when a Construction Change Directive is not agreed upon by the Contractor, the Contractor shall continue to perform the change in the Work involved so as not to delay the Project and the Contractor's sole remedy against the Owner under this Agreement shall be pursuant to Article 15 of these General Conditions.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost plus overhead and profit as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment to the extent that such Work was completed under the Construction Change Directive. For any portion of such cost that remains in dispute, the Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive. The Contractor's agreement to a Change Order, or acceptance of payment therefore, or the Contractor's agreement to a Construction Change Directive, shall constitute a final settlement of all of the Contractor's rights, claims, and remedies relating to the change in the Work which is the subject matter thereof, including, without limitation, all direct and indirect costs, and all adjustments to the Contract Sum and the Contract Time or Project Construction Schedule. If the Owner and the Contractor do not agree with the Construction Manager's determination, then the parties shall resolve the dispute pursuant to the terms and conditions of Article 15.

§ 7.4 Minor Changes in the Work

§ 7.4.1 The Architect has the authority to order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing issued through the Construction Manager, such as meeting memoranda or an Architect's Supplemental Instruction, and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall promptly notify the Construction Manager, shall not proceed to implement the change in the Work, and shall present a fully itemized Change Order request to the Architect within five (5) working days, or shall notify the Architect in writing of the date by which such request shall be received. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.4.1.1 If the Contractor believes that the Work described therein requires an adjustment of the Contract Sum, or of the Contract Time, the Contractor shall issue a fully itemized proposal within five (5) Working days or shall notify the Architect in writing of the date by which such proposal shall be received.

§ 7.4.2 The Architect from time to time, as deemed necessary or if requested by the Owner and Construction Manager, will furnish supplementary instructions to clarify or amplify the Drawings and Specifications (Contract Documents). The supplementary instructions may be by means of drawings, or otherwise as is most appropriate, which will be

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consistent with the Contract Documents and true developments thereof, or amplifications reasonably inferable therefrom. The supplementary instructions shall be considered minor clarifications in the Work and shall not be an authorization for the Contractor to incur additional cost.

§ 7.4.3 The Owner reserves the right to change the location of any piece of apparatus or equipment within five (5) feet of location shown, up to the time of rough-in, without additional expense to the Owner. The changes of the location shall be considered minor changes in the Work and shall not be an authorization for the Contractor to incur additional cost.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Notice to Proceed issued by the Architect or Construction Manager. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time, including the phasing schedule, and all activities, events, and milestones, is a reasonable period for performing the Work. The dates listed in the construction schedule are of the essence and the Contractor agrees to schedule, coordinate, and staff in accordance therewith based on the actual progress of the Work as necessary to maintain the orderly progress of the Work in accordance with the construction schedule.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner.

§ 8.2.3 The Construction Manager in coordination with the Project Coordinator will set work hours. The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. Contractor agrees to increase manpower; increase work hours; work nights, weekends, and holidays; and to increase equipment necessary to maintain the Project schedule. Such measures undertaken by the Contractor will be at no additional cost to the Owner.

§ 8.2.3.1 The Contractor shall adhere to any applicable noise ordinance provisions. Under no circumstances will the Contractor begin or continue with Work that is adversely impacting Owner operations. Work impacting Owner operations is required to be performed during non-school operating hours, as determined by the Owner or Construction Manager, at no additional cost to the Owner. All utility shutdowns, interruptions, and work in or adjacent to existing buildings will be coordinated through Construction Manager and may have to be performed during hours to accommodate the Owner's operations. All cutting, hammering, or other activity that is noisy, produces smoke or fumes, or is otherwise disruptive to the Owner's operations may have to be done during hours when the school is not in session.

§ 8.2.4 The Notice to Proceed shall be given to the Contractors on all branches of Work concurrently and all Contractors shall be prepared to undertake their Work at such times as the progress of the Work permits them to do so.

§ 8.2.5 The Work shall be substantially completed no later than the date(s) stated in the Contract Documents, and for each milestone and phase where applicable, subject to extensions of time approved in writing by the Owner. All

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Contractors shall cooperate with each other and shall coordinate their activities and Work so that the entire program of construction can be substantially completed on or before the completion dates for each milestone and phase.

§ 8.2.6 The Contractor shall complete the whole of the Work, and all milestones and phases as applicable, at or before the time or times stated. Contractor shall submit shop drawings and samples of material to be used, as required, and make delivery of material in accordance with the Project schedule. Contractor shall furnish, at all times, sufficient skilled workers, materials, and equipment to perform the Work so as not to delay the completion of the whole or any part of the Project.

§ 8.2.7 It is mutually agreed by and between the parties hereto that time is of the essence as to each part of the Contract and that in case of the failure on the part of the Contractor to complete any part of the Contract within the time specified and agreed upon, the Owner will be damaged thereby. Further, it is mutually agreed that the amount of said damages, including, but not limited to, expenses for inspection, superintendence, and necessary traveling expenses, being difficult, if not impossible, of definite ascertainment and proof, it is hereby agreed that the reasonable amount of liquidated damages shall be in accordance with Section 9.11.

§ 8.2.7.1 In addition to the liquidated damages set forth in Section 9.11, the Contractor agrees to pay all associated costs for the Construction Manager and Architect to extend their agreement to remain on the Project due to the failure of the Contractor to complete the Work within the time frame stipulated. Damage to Contractor by delay of other contractors shall be recovered pursuant to Section 6.2 of these General Conditions.

§ 8.2.8 Adherence to Schedule

§ 8.2.8.1 The Owner reserves the right to withhold monthly progress payments if the Contractor is behind schedule, unless the Contractor proves, in writing, that the delays are not the fault of the Contractor and to which the Construction Manager agrees.

§ 8.2.8.2 The monthly progress payments will only be released after the Contractor reaches the status of completion for that month indicated in the Project construction schedule.

§ 8.2.8.3 In the event the Construction Manager determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents and the Project construction schedule, the Owner or Construction Manager shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, but not limited to, working additional shifts or overtime; supplying additional manpower, equipment, and facilities; and other similar measures (referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the Project construction schedule and failure to comply shall be considered as a material breach of the Contract Documents. The Contractor shall not, under any circumstances, be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by Owner under or pursuant to Section 8.2.8.

§ 8.2.8.4 The Owner may exercise its rights pursuant to Section 8.2.8.3 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any completion dates set forth in the Contract Documents.

§ 8.2.9 PROCUREMENT SCHEDULE

If requested by the Construction Manager, the Contractor shall provide a procurement schedule within a reasonable period of time which shows items to be purchased, date of purchase, quoted dates of delivery, current estimated date of delivery, and last date of contact with the vendor. The procurement schedule shall be updated as requested by the Construction Manager.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces; (2) by changes ordered in the Work; (3) by fire, unusual delay in deliveries, unavoidable casualties, adverse weather

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conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner in writing; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended by Change Order to the extent such delay shall prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time for delay will only be allowed to the extent such delay is not caused by the Contractor, could not have been anticipated by the Contractor, could not be limited or avoided by the Contractor's timely notice to the Owner of the delay, and is of a duration not less than one (1) day. Where the delay arises from acts, omissions, or defaults of another Prime Contractor or the other Prime Contractor's Subcontractors or suppliers, then the Contractor will be entitled no extension of time and its sole remedy will be pursuant to Section 6.2 of the General Conditions.

§ 8.3.1.1 No extension of Contract Time will be considered or approved if the act or occurrence constituting the basis of the request or claim is for non-delivery of materials due to any act or neglect of the Contractor, or the failure of the Contractor to employ, furnish or obtain, as necessary for the timely prosecution of the Work, shop drawings, sufficient labor, materials or equipment, or other matters which shall be within the control of the Contractor. Any delay which results due to any of the foregoing causes shall be the sole responsibility of the Contractor.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, an extension in the Contract Time, to the extent permitted under this Section 8.3, shall be the sole remedy of the Contractor against the Owner, Construction Manager or Architect for (1) delay in the commencement, prosecution or completion of the Work; (2) hindrance or obstruction in the performance of the Work; (3) loss of productivity; or (4) other similar claims (collectively referred to in this Section 8.3.3 as "delays") whether or not such delays are foreseeable, unless a delay is caused by the acts of the Owner constituting active interference with the Contractor's performance of the Work, and only to the extent that such acts continue after the Contractor furnishes the Owner with written notice of such interference. In no event shall the Contractor be entitled to any compensation or recovery of any damages against the Owner, Construction Manager, or Architect, in connection with any delay, including, without limitation, consequential damages, lost opportunity cost, impact damages or similar remuneration. No payment or compensation shall be made to the Contractor by Owner as compensation for damages for any delays or hindrances from any cause whatsoever in the progress of the Work, notwithstanding whether such delays be avoidable or unavoidable. The Contractor's sole remedy against Owner, Architect or Construction Manager for delays shall be an extension of Contract Time, pursuant to and only in accordance with this Section 8.3. The Owner's exercise or failure to exercise any rights or remedies under the Contract Documents (including without limitation, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work), regardless of the extent or frequency thereof, shall not be construed as active interference with the Contractor's performance of the Work. Such extension shall be a period equivalent to the time lost, day for day, by reason of any and all of the aforesaid causes. The Contractor shall not be permitted to make any claim for acceleration or for costs or expenses associated with acceleration nor will the Contractor be permitted to make a claim for out-of-sequence work (e.g., winter protection costs). In the event that the Contractor chooses to assert such a claim for delay, acceleration, or out-of-sequence work, or litigate this provision, the Contractor shall be liable to the Owner, Architect and Construction Manager for any attorney's fees, professional fees, costs, or expenses associated with analyzing, defending, or otherwise opposing any such claim or litigation.

§ 8.3.4 The Owner, Architect and Construction Manager shall not be liable to the Contractor for any expenses, damages, loss of profits (anticipated or otherwise) or charges of any nature whatsoever (including, but not limited to, legal fees and professional fees) which shall result because of any extension of the time of completion which shall be granted by the Owner to the Contractor or to any other contractor employed by the Owner to perform any other portion of the Project, or which shall result because of any delay or hindrance of any nature whatsoever in the progress of the Work (e.g., winter protection costs), whether such delay or hindrance shall be avoidable or unavoidable. In the event the Contractor chooses to litigate and fails to prevail as to its entire claim in its litigation, the Contractor shall reimburse the Owner, the Construction Manager, and the Architect for any legal fees, professional fees and all other costs and expenses associated with analyzing, defending, or otherwise opposing any such claim or litigation.

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§ 8.3.5 The Contractor shall recognize and reasonably anticipate that as the job progresses, the Project Coordinator will be making changes in and updating the Contractor's construction schedules pursuant to Section 3.10. Therefore, no claim for an increase in the Contract Sum for either acceleration, delay or out-of-sequence work will be allowed for decisions as to extensions of time pursuant to this Section 8.3 or for other changes in the construction schedules which may be experienced.

§ 8.3.6 No extension of Contract Time granted by the Owner shall be or shall be deemed to be a waiver by the Owner of any rights accruing to it under the Contract Documents and no extension of Contract Time granted by the Owner shall relieve or shall be deemed to relieve the Contractor from full responsibility for performance of the Work.

§ 8.3.7 Should the Owner be prevented or enjoined from proceeding with the Project either before or after the start of construction by reason of any litigation or any other reason beyond the control of the Owner, the Contractor shall not be entitled to make or assert claims for damage by reason of said delay, or for acceleration or out-of-sequence work; but time for completion of the Work will be extended to such reasonable time as the Owner and Architect may determine will compensate for time lost for such delay with such determination to be set forth in writing.

§ 8.3.8 Any delay attributable to lack of coordination or cooperation by and/or between Contractor and its Subcontractors, Sub-subcontractors, or any of the Prime Contractors will not be recognized by the Owner as a basis for any claim for increasing the Contract Time but shall be settled as provided in Section 6.2 of the General Conditions.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Within 14 days of receipt of the Notice to Proceed, the Contractor shall submit a schedule of values to the Construction Manager and Architect, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.2.1 Contractor shall include the following specific costs, among others, in its schedule of values:

- **.1** Punch list Work – Minimum of 1% of Contract Sum
- **.2** Testing
- **.3** $10,000.00 for Record Drawings and Close-Out documents
- **.4** Final clean-up and monthly value for daily clean-up by General Contractor
- **.5** Equipment start-ups and commissioning
- **.6** Shop Drawings
- **.7** Owner's attic stock
- **.8** Safety protections
- **.9** Site safety and security
- **.10** Temporary construction fence
- **.11** Project Schedule and Monthly Updates
- **.12** Winter protection
- .13 Coordination Drawings
- **.14** Owner Training

§ 9.3 Applications for Payment

§ 9.3.1 By the twenty-fifth (25th) day of each month, the Contractor shall submit to the Construction Manager and Architect a draft itemized Application for Payment prepared in accordance with the schedule of values and Contract

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Documents, for completed portions of the Work. Upon approval of the Construction Manager and Architect, the Contractor shall submit at least five (5) copies of the Application for Payment, their certified payroll reports, and Affirm Action monthly manning reports. Incomplete applications will not be processed. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. The form of Application for Payment shall be notarized AIA Document G702 or G732, Application and Certificate for Payment, supported by AIA Document G703 or G733, Continuation Sheet. By signing each Application for Payment, the Contractor stipulates and certifies to the following: that the information presented is true, correct, accurate and complete; that the Contractor has made the necessary detailed examinations, audits and arithmetic verifications; that the submitted Work has been completed to the extent represented in the Applications for Payment; that the materials and supplies identified in the Applications for Payment have been purchased, paid for and received; that the Subcontractors have been paid as identified in the Applications for Payment or that Contractor has been invoiced for same; that he has made the necessary on-site inspections to confirm the accuracy of the Applications for Payment; all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current application; and that the Payment Application includes only Work self-performed by Contractor or for which Contractor has been invoiced.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders. Owner may withhold payment on disputed Construction Change Directive amounts.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Work applicable to the Contract Sum shall be kept separate from Work applicable to Change Orders. The Work of each shall contain a summary and a breakdown as stipulated by the Contract Documents.

§ 9.3.1.4 Contractor expressly waives any right to penalties, interest, and attorney's fees pursuant to the prompt payment provisions of the Pennsylvania Commonwealth Procurement Code, 62 Pa. C.S. § 3931 et seq.

§ 9.3.1.5 The Owner shall make payment to the Contractor not later than ten (10) business days after the next regularly scheduled Board of School Directors meeting following Architect's receipt of the complete Application for Payment, as more fully described in the Division 01 Section "Payment Procedures."

§ 9.3.2 Stored Materials Payment on account of materials and equipment shall be made subject to the following:

§ 9.3.2.1 Materials Stored Onsite. Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work, subject to the following conditions: (1) All materials shall be stored in strict compliance with the manufacturer's recommendations in secure, dry, and where appropriate, temperature controlled enclosures; (2) Contractor shall provide property insurance covering materials stored at the construction site; (3) Contractor shall provide an accurate inventory of all materials included for payment with each application for payment and shall maintain the inventory until the materials are installed or otherwise incorporated into the Work; and (4) payment for materials stored on the construction site shall be limited to the actual, invoiced cost to the Contractor, F.O.B. the construction site. Contractor shall warrant that all suppliers are promptly paid in full for all materials included for payment and that materials are not encumbered by any lien, claim or mortgage that would prevent the Owner from taking full possession of the materials. Contractor shall produce satisfactory evidence of same to Owner.

§ 9.3.2.2 Materials stored off the construction site shall not be included for payment in the Contractor's application for payment unless prior written approval of the Owner has been obtained. Payment for materials stored off the construction site shall be subject to the conditions in Section 9.3.2 and the following additional conditions:

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.1 Contractor shall provide property insurance for the full cost of the materials stored off the construction site.

.2 Contractor shall provide a bill of sale for the materials granting clear title to the materials to the Owner.

.3 Contractor shall provide waivers of liens, encumbrances or claims relating to the bailment of the materials stored off site or as otherwise required by Owner.

.4 Contractor shall provide Owner all information necessary for the filing of any notices under the Uniform Commercial Code relating to the materials stored off the construction site as may be required by Owner.

.5 The materials stored off the construction site shall be clearly and conspicuously labeled so as to identify Owner's title to the materials and shall be segregated and not commingled with other materials at the storage location.

.6 Contractor shall pay all storage costs, shall be responsible for any damage or deterioration of the materials while in storage or in transit to the construction site and shall pay the cost of inspection of the materials in storage by the Owner.

.7 Contractor shall be responsible for and shall pay all costs of transportation of the materials to the construction site.

.8 Neither Owner's payment for materials stored off the construction site nor the transfer of title to Owner shall in any way reduce Contractor's liability for the complete installation and construction relating to said materials or liability under any performance bond provided for the Project; and

.9 Contractor agrees to make the materials available for inspection by the Owner or Owner's representative at any time upon Owner's request.

§ 9.3.2.3 Materials stored on or off site shall be covered at all times from the weather. Any material or equipment, including outdoor exposed equipment, shall be suitably covered and protected at all times until final installation.

§ 9.3.2.4 The Contractor in making or ordering material shipments shall not consign or have consigned materials, equipment, or any other items in the name of the Owner. The Owner shall not be under any obligation to make payment for charges on shipments made by or to the Contractor but may, at its option, pay such charges in which case the Contractor shall reimburse the Owner for the amount of such payments plus a service charge of twenty-five percent (25%) of the amount so paid.

§ 9.3.2.5 Materials delivered and stored both on and offsite are the responsibility of the Contractor. The Contractor shall be solely responsible for their safekeeping and usability at the time they are to be incorporated in the Work, and shall, at their own expense, care for and protect the same, employ security as needed, and take out insurance against theft, loss from other cause, damage, destruction and/or such other risks as may be involved which would render the aforesaid materials unfit or unsuitable for use in the Project. Any lost, stolen, or damaged materials shall be replaced at Contractor's expense. Materials shall not be delivered earlier than reasonably necessary for proper progress of the Work unless prior approval is granted by the Owner.

§ 9.3.2.6 All material and work incorporated in the Work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work. Contractor shall indemnify, defend, and hold Owner harmless from any liens, claims, security interests or encumbrances filed by the Contractor, Subcontractors, or anyone claiming by, through or under the Contractor or Subcontractor for items covered or partially covered by payments made by the Owner to Contractor.

§ 9.3.4 Retainage

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§ 9.3.4.1 In accordance with 62 Pa. C.S.A. §3921, the Owner shall retain ten percent (10%) of all amounts due the Contractor until the Work is fifty percent (50%) completed. When the Work is fifty percent (50%) completed, one-half of the amount retained by the Owner may be returned to the Contractor, provided the Contractor provides written Consent of Surety to such reduction in retainage to the Construction Manager along with its Application for Payment, provided the Architect approved the Application and reduction of retainage, and further provided that the Contractor is making satisfactory progress and there is no specific cause for greater withholding. A specific cause for greater withholding shall include, without limitation, the following:

.1 The Contractor's inability to produce evidence satisfactory to the Construction Manager and/or the Owner evidencing payments for materials, labor and/or payments to Subcontractors, manufacturers, or suppliers.

.2 Intentionally deleted.

.3 Contractor's failure to complete the Work in accordance with the Contract Documents, including without limitation, the Drawings and Specifications; or

.4 Defective Work or damaged Work identified subsequent to installation.

.5 Failure to comply with any of the Project requirements including, but not limited to, schedule, coordination, staffing, supervision, subcontractors, submittals, etc.

§ 9.3.4.2 In addition to the Owner's right to determine if a specific cause for greater withholding exists, the Architect and Construction Manager shall be entitled to determine if a specific cause for greater withholding exists under this Section. The Architect and Construction Manager may, with Owner's approval, reject the reduction in retainage if the Contractor is not making satisfactory progress in its Work or if the Architect and Construction Manager determines that there is a specific cause for greater withholding. The Architect and Construction Manager will consider the following items when reviewing a request for reduction in retainage and failure to meet any of the following requirements may be considered by the Architect and Construction Manager as sufficient grounds for rejecting a reduction of retainage. The Architect's and Construction Manager's decision to reject a reduction of retainage shall be final and binding on the Prime Contractors.

.1 Satisfactory performance of the Work.

.2 Satisfactory maintenance of the Project schedule.

.3 Proper manning of the Project.

.4 Satisfactory completion of the Work.

.5 Satisfactory organization of the Project.

.6 Proper organization and coordination of Subcontractors.

.7 Proper coordination with other Prime Contractors, Owner's forces, and Separate Contractors.

.8 All defective Work has been remedied or is in the process of being remedied.

.9 Work completed is not in contention.

.10 Satisfactory follow through of paperwork, certified payrolls, Change Order proposals, or Construction Change Directives.

.11 Satisfactory compliance with all government statues, regulations and laws including but not limited to local government ordinances and the rules and regulations promulgated for the PA Department of Environmental Protection and the County Conservation District.

§ 9.3.4.3 The Owner shall retain five percent (5%) of all amounts due the Contractor after the Work is fifty percent (50%) completed. In the event a dispute arises between the Owner and a Prime Contractor or Separate Contractor, which dispute is based upon increased costs claimed by the Prime Contractor or Separate Contractor occasioned by delays, or other actions of the Contractor, additional retainage in the sum of one and one-half times the amount of any possible liability may be withheld until such time as a final resolution is agreed to by all parties directly or indirectly involved, unless the Contractor furnishes a bond satisfactory to the Owner to indemnify the Owner against the full claim.

§ 9.3.4.4 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Owner, Construction Manager and Architect, or if the Surety withholds its consent, or for other good and sufficient reasons.

§ 9.3.4.5 All monies retained by the Owner may be withheld from the Contractor until Substantial Completion of the Project.

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§ 9.4 Certificates for Payment

§ 9.4.1 Intentionally deleted.

§ 9.4.2 The Construction Manager will, within seven days after the Construction Manager receives the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due to each Prime Contractor; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Prime Contractor's application with information from similar applications for progress payments from the other Prime Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due to each Prime Contractor; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors no later than the date established for such progress payment.

§ 9.4.3 The Construction Manager's certification of a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractors are entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Project Application and Certificate for Payment shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to continuing observations and ongoing evaluations of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment, shall not certify payment, and will withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be

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necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

.1 defective Work not remedied;
.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials, or equipment;
.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor or other Contractor;
.6 reasonable evidence that the Work will not be completed within applicable Project milestone or otherwise within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 failure to carry out the Work in accordance with the Contract Documents;
.8 failure to submit Prevailing Wage Certifications as required;
.9 failure to comply with governmental statutes, regulations, laws, rules, ordinances, and lawful orders of governmental authorities with jurisdiction over the Project;
.10 failure to comply with Project milestones, phasing, coordination, or scheduling requirements;
.11 failure to adequately staff the Project;
.12 failure to confirm in writing that the record drawings are up to date prior to submitting an Application for Payment; and
.13 failure to cooperate with other Contactors and/or Construction Manager in connection with material storage, clean up, or safety.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.2.1 If the Contractor disputes any determination by the Construction Manager or the Architect with regard to any Certificate of Payment, or the Owner's withholding of payment pursuant to Sec. 9.6.1.1, the Contractor nevertheless expeditiously shall continue to prosecute the Work.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment. The Contractor and such Subcontractor shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint payment be construed to create any (i) contract between the Owner and a Subcontractor of any tier, (ii) obligations from the Owner to such Subcontractor or (iii) rights in such Subcontractor against the Owner.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents and shall so notify the Construction Manager and Architect. Such payment by the Owner shall not constitute approval or acceptance of any item of cost in the Application for Payment. No partial payment made hereunder shall be or be deemed to be final acceptance or approval of that portion of the Work to which such partial payment relates or relieve the Contractor of any of its obligations hereunder with respect thereto.

§ 9.6.1.1 Notwithstanding Certification by the Architect, the Owner may refuse to make payment based on any default by the Contractor including, but not limited to those defaults set forth in Subparagraphs 9.5.1.1 through 9.5.1.13. The Owner shall not be deemed in default by reason of withholding payment while any of such defaults by the Contractor remain uncured regardless of whether or not the Architect signed the payment application. The Owner shall notify

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the Architect, Construction Manager, and Contractor of the bases for the withholding of payment within fourteen days of receipt of the Certificate of Payment or Project Certificate of Payment and shall make payment of any undisputed amounts. If Contractor disputes Owner's bases for withholding payment, it may file a claim pursuant to Article 15. The Owner shall issue payment for any disputed amounts no more than seven days after Contractor, to the Owner's satisfaction, resolves the default for which payment was withheld.

§ 9.6.2 The Contractor shall pay each Subcontractor and supplier, no later than 20 days after receipt of payment from the Owner, the amount to which the Subcontractor or supplier is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. Contractor and each Subcontractor shall comply with the payment provisions of Section 3933 of the Pennsylvania Commonwealth Procurement Act, 62 Pa. C.S §3933.

§ 9.6.2.1 The Contractor shall, at the request of the Owner, the Construction Manager, or the Architect, prior to the submission of an Application for Payment, submit an affidavit signed by the Contractor, Subcontractors', manufacturers and/or suppliers that they have been paid for their portion of the Work from previous Applications for Payment such Subcontractors, manufacturers and/or suppliers have performed Work

§ 9.6.3 The Construction Manager may, on request, furnish to a Subcontractor or supplier, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor or supplier.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner, Architect, and Construction Manager from all loss, liability, damage, or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If through no fault of the Contractor, the Owner does not pay the Contractor within forty-five (45) days after the date established in the Contract Documents the amount certified by the Construction Manager and Architect, and provided the Owner's withholding of payment was not made subject to Section 9.6.1.1, then the Contractor may, upon fourteen (14) additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended for the amount of time the Contractor stopped Work. Contractor shall not stop work or terminate this Agreement if the Architect or Construction Manager should

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refuse to issue a Certificate of Payment because the Application for Payment or Work does not conform with the requirements of the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents, and the local authorities having jurisdiction have issue a final Certificate of Occupancy so the Owner can occupy or utilize the Work for its intended use. In general, the only remaining Work shall be minor in nature, so that the Owner can occupy the building or major area thereof on that date and the completion of the Work by the Contractor would not materially interfere with or hamper the Owner's normal operations. Contractor recognizes that 'normal operations' require the use and occupancy of the Work by the public, students, and Owner's staff without interruption and that any punchlist or corrective work shall be done at times when the Work is not so occupied unless otherwise permitted by Owner.

§ 9.8.1.1 The Date of Substantial Completion will be established after the Construction Manager's receipt of the Contractor's Notification for Substantial Completion inspection and the Architect's and Construction Manager's inspection and concurrence that the Work has achieved Substantial Completion.

§ 9.8.1.2 For Substantial Completion to occur for the Contractor, the following conditions shall be met:

- **.1** All of the Project parts and systems are accessible, operable, and usable by the Owner, including the site work, HVAC systems, plumbing, electric, and Life Safety Systems, and commissioning of such systems has been successfully completed.
- **.2** The Project is clean, as defined elsewhere in the Contract Documents.
- **.3** Operation and maintenance manuals have been submitted to the Architect through the Construction Manager.
- **.4** Training of the Owner's personnel has taken place as required elsewhere in the Specifications.
- **.5** Annotated Record Drawings have been submitted to the Architect through the Construction Manager.
- **.6** All Federal, State, and local authorities having jurisdiction over the Project have issued the requisite occupancy permits and/or approvals so that the Owner can occupy or utilize the Work for its intended purpose.

§ 9.8.2 When the Contractor considers that the entire Work, or the Work of a separate Phase (as defined in Division 01 Section "Summary" or on Phasing Drawings), is substantially complete, the Contractor shall prepare and submit to the Construction Manager and Architect its own comprehensive list of items (punchlist) to be completed or corrected prior to Final Completion and payment to Contractor ,an application by the Contractor for Certificate of Substantial Completion by the Architect, and all special warranties required by the Contract Documents endorsed by the Contractor. If after the punchlists are submitted and upon inspection, it is found that a Contractor's punchlist is incomplete, lengthy, or ill prepared, the Substantial Completion request will be denied. If it is required because of a Contractor's incomplete, lengthy, or ill prepared punchlist or the Contractor's inability to complete its punchlist and, therefore, complete the Contract, that the Architect, the Construction Manager, or any of their consultants or representatives or the Owner, is required to prepare a punchlist, then the Contractor will be solely responsible for such the costs associated with the creation of the punchlist. Such costs may be back charged to Contractor and deducted from any existing retainage or subsequent Application for Payment. In the event that the Architect, the Construction Manager, or any of its consultants or representatives, or the Owner is required to prepare punchlists, the Contractor will be in default of the Contract. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's punchlist and Application for Certificate of Substantial Completion, the Architect, assisted by the Construction Manager, shall make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the punchlist, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion. If more than one inspection for Substantial Completion

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is required, the Contractor will be billed and responsible for the professional fees and services of the Architect and/or Construction Manager for performing all subsequent inspections.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the punchlist accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.4.1 The Certificate of Substantial Completion shall be subject to the Owner's final approval.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Within forty-five (45) days of the Certificate of Substantial Completion, and consent of surety if any, the Owner shall make payment to the Contractor equal to the full Contract Sum less one and one half (1-1/2) times such amount that is required to complete and/or correct any then remaining items, which amount shall be certified by the Architect.

§ 9.8.5.1 Inspections for Substantial Completion will be conducted only at the completion of the Project or a scheduled phase of the Project. Such inspection will take place only when all Prime Contractors are complete with the Project or that scheduled phase of the Project. Any items to be completed or corrected that remain on the punchlist shall have a value of 150% of the cost affixed to them. Construction Manager, after consultation with the Architect, will provide the valuation. Such amount shall be retained from payments and held until the items are completed or corrected to the satisfaction of the Architect and Final Payment is due Contractor.

§ 9.8.5.2 In no event shall the Project or portion thereof be certified as substantially complete until at least 90% of the Work on the Project, or portion thereof, is complete.

§ 9.8.5.3 Intentionally deleted.

§ 9.8.6 In no case shall the time established for the completion and correction of items on the list extend beyond thirty (30) days after certification of Substantial Completion, except for delay beyond the Contractor's control. The Contractor shall pay for all architectural and consultant services incurred thereafter due to the failure of Contractor to complete and/or correct Work on the list or to submit documentation and items required for Final Completion and Final Payment. Such costs may be back charged to Contractor and deducted from any existing retainage or subsequent Application for Payment.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Construction Manager and Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager. Contractor shall not withhold partial occupancy or use from Owner due to failure of the Contractor to complete the Work in accordance with the Contract Documents in the time stipulated in the Agreement and approved Change Orders, if any, for extension of time.

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§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.9.4 As Work is completed and occupied, the Contractor shall ensure the continuing construction activities will not unreasonably interfere with the use, occupancy, and quiet enjoyment of the completed portions thereof.

§ 9.9.5 The Contractor agrees to coordinate the Work with the Construction Manager, the Architect, and the Owner in order to minimize disturbance to occupied portions of the structure. In the event performances or tests are conducted in close proximity to the Work in progress, the Contractor agrees to cease all Work which may disturb the Owner's occupants.

§ 9.9.6 The Owner shall have the right to occupy and erect or place any apparatus or equipment in any part of the Project without such installation being construed as an acceptance of any of the Contractor's workmanship or materials, or as affecting any terms in the Contract. Prior, however, to the Owner taking possession, an inspection will be made by the Construction Manager, Architect, and Owner of the area and any subsequent damage due to occupancy by the Owner will not be the responsibility of the Contractor.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed ("Final Completion"), the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.1.1 The Architect shall make final inspection within thirty (30) days following receipt of the Contractor's request for final inspection and final Application for Payment. The Architect's Certificate of Final Completion shall be subject to the Owner's final approval.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied; (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect; (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents; (4) consent of surety, if any, to final payment; (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties and their assignment to Owner, prepared in duplicate; (6) final "as-built" prints of record drawings marked by the Contractor with record information as set forth in the Contract Documents and other record documents, if any; (7) a final Contractor's sworn statement showing all Subcontractors and material and equipment suppliers to be fully paid and similar sworn statement from Subcontractors and Sub-Subcontractors confirming that they have been paid; (8) other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner; and (9)

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evidence of compliance with all requirements of the Contract Documents, including but not limited to (a) instruction of Owner's representatives in the operation of mechanical, electrical, plumbing and other systems; (b) delivery of keys to Owner with keying schedule: master, sub-master and special keys; (c) delivery to Architect of a printed or typewritten operating, servicing, maintenance and cleaning instructions for all Work, parts lists and special tools for mechanical and electrical Work, and (d) delivery to Owner of a Final Waiver of Liens (AIA Document G-706 or other form satisfactory to Owner), covering all Work including that of all Subcontractors, vendors, labor, materials and services, executed by an authorized officer and duly notarized. In addition to the foregoing, all other submissions required by other articles and paragraphs of the Specifications including final construction schedule shall be submitted to the Architect before approval of final payment. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.3.1 If more than one inspection for Final Completion is required, the Contractor will be billed and responsible for the professional fees and services of the Architect and/or Construction Manager for performing all subsequent inspections. Following Substantial Completion, in the event the Contractor or Subcontractor fails to complete the list of items of the Work instructed by the Architect or Construction Manager to be corrected or completed within the time period set forth elsewhere in the Contract Documents or if no such time period is set forth elsewhere in the Contract Documents, then 30 days from Substantial Completion, the Owner may: (i) exercise any available remedies to correct or complete deficient Work or retain a third party to correct or complete such Work at the cost of the Contractor; (ii) retain and deduct from any payments or retention otherwise due to the Contractor any fees and expenses for services required to be provided by the Architect and/or Construction Manager; (iii) recover against the Contractor and Surety under the Performance Bond, as part of its damages any and all legal fees and professional fees, jointly and severally, and all other costs and expenses incurred by the Owner in connection with the Owner's pursuit of its rights under the Contract and Performance Bond, including, but not limited to, any and all legal fees, professional fees, and all other costs and expenses related thereto. The Owner shall have the right to set off said amounts against any amount alleged to be due and owing to the Contractor under the Contract.

§ 9.10.4 The making of final payment shall not constitute a waiver of Claims by the Owner.

- **.1** Intentionally deleted.
- **.2** Intentionally deleted.
- **.3** Intentionally deleted.
- **.4** Intentionally deleted.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously asserted in a timely manner and in accordance with the Contract Documents and specifically identified in writing as unsettled at the time of final Application for Payment.

§ 9.11 Liquidated Damages

§ 9.11.1 The Contractor and Contractor's Surety shall be jointly and severally liable for and shall pay the Owner the cost of expenses incurred by the Owner resulting from the Contractor's delay in completing the Work of the Contract within the Contract Time, as liquidated damages, but not as a penalty, in the amounts listed below, for each calendar day (Sunday and holidays included) of delay from the Substantial Completion date for each phase and for the entire

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Project, as indicated in the Contract Documents, until the Work is substantially complete (as defined in Articles 8 and 9.8), subject to adjustments of the Contract Time as provided in the Contract Documents.

General Construction Contract	$3,000 per day
All other Contracts	$2,000 per day

In the event the Contractor or Surety litigates the validity of this provision or the assertion of liquidated damages, the Contractor and Surety, jointly and severally, shall also be liable for legal fees, professional fees, costs, other expenses and/or damages incurred by the Owner. This liquidated damages provision applies to each phase of construction as well as the Substantial Completion date for the entire Project. Owner's right to receive liquidated damages shall be in addition to all other rights and remedies available to the Owner at law or in equity.

§ 9.11.2 If any other Prime Contractor shall be responsible, in the opinion of the Construction Manager and Architect, for delay in the time of completion of the Work of the Contractor then the Prime Contractor so determined to be responsible shall be liable for and shall pay to the Owner all liquidated damages otherwise attributable to the Contractor, as well as any legal fees, professional fees, or other costs or expenses incurred by the Owner.

§ 9.11.3 The Owner shall have the right to deduct the total amount of liquidated damages for which the Contractor may be liable under this Article from any payments then or thereafter due the Contractor. The Surety upon the Contract Bonds furnished by the Contractor shall be liable for any fixed, agreed, and liquidated damages for which the Contractor may be liable under this Section to the extent that the Contractor shall not make settlement thereof with the Owner.

§ 9.11.4 In addition to the Liquidated Damages established in this Section 9.11, the Contractor agrees to pay all associated costs for the Construction Manager and Architect to extend their Contract to remain on the Project due to the failure of the Contractor to complete the Work within the time frame stipulated in the Project Schedule. Damages to other Prime Contractors due to the extension of this Project duration shall be pursued in accordance with Article 6 of the General Conditions of the Contract.

§ 9.11.4.1 The determination of these costs will be based on the level of completion of the Work by the Contractor.

§ 9.11.4.2 Should a single Prime Contractor fail to complete the Project within the time frame stipulated, that sole Contractor shall be responsible for all costs listed in Section 9.11.4.

§ 9.11.4.3 Should more than one Prime Contractor fail to complete the Project within the time frame stipulated, the costs will be divided and apportioned proportionally to the level of completion of the Work and the value of the separate Prime Contractor's Contract Sum weighted against the total Project cost of all separate Prime Contracts.

§ 9.11.5 Liquidated damages for failure to correct "punchlist" items shall be calculated at the following rates for each calendar day of delay beyond 30 calendar days after certification of Substantial Completion or phased completion until Work for corrections is complete.

Each Prime Contract	$500 per day

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's OSHA-compliant, site-specific safety program to the Construction Manager within 14 days after receipt of the Notice to Proceed. The Contractor shall maintain and submit a complete copy of the written safety plan, logs, diaries, plans and programs on site for the Construction Manager. The Construction Manager's responsibilities for verification of safety programs shall not extend to any review of the adequacy of the Contractor's safety program, or control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work. Each Prime Contractor is responsible for safety of their Work and

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that of their Subcontractors. The General Contractor is responsible for overall site safety and shall serve as the Project's responsible party for safety.

§ 10.1.1 The Contractor's safety program shall reference Federal and State OSHA standards and other rules and regulations applicable to construction activities on the Project. The Contractor's Project Safety and Health Program shall include, without limitation, as a minimum, the following:

§ 10.1.1.1 New Hire Safety and Orientation Program: Each new or reassigned employee of the Contractor shall receive a thorough safety orientation including, without limitation, employer/employee responsibilities under Federal and State OSHA regulations, ear protection in high noise level areas, respiratory protection, Material Safety Data Sheets (MSDS), fire protection, first aid facilities, and look-out procedures on electrical equipment. Attendance at the New Hire Safety and Orientation Program meeting is required, and records must be kept on file in the Contractor's office for review.

A§ 10.1.1.2 The Contractor shall furnish 2 sets of Material Safety Data Sheets (MSDS) to the Construction Manager for all materials used on the Project in accordance with governmental requirements. In addition, the Contractor shall maintain 1 set of MSDS on the Project site for periodic inspection by the Owner and the Construction Manager. The Contractor shall be responsible for continually updating their MSDS sheets on site and provide the Construction Manager with any revisions to the MSDS. The Contractor shall post all required notifications relating to the use of hazardous substances used in Contractor's Work on the property. The Contractor shall be responsible for compliance with OSHA and the Hazard Communications Standard.

§ 10.1.1.3 Weekly Toolbox Safety Meetings: The Contractor shall conduct Weekly Toolbox Safety Meetings to provide employees with current safety information. Attendance is required and records must be kept on file in the Contractor's office for review.

§ 10.1.1.4 The written safety plan to be submitted by each Contractor and Subcontractor shall also include, but is not limited to, the following:

.1 Full time hard hat policy (identifying hard hats shall be worn at all times).
.2 Site specific emergency action plan with Contractor phone numbers, active 24 hours a day, 7 day a week.
.3 Identification of the Contractor's competent onsite safety representative, with alternate.
.4 Scaffold erection plan, including a log of daily inspections.
.5 Full-time fall protection plan for exposures over 6'-0."
.6 Job site signage plan with perimeter fence warning signs posted at fifty foot intervals.
.7 First aid and CPR provisions.
.8 OSHA 200 log and a Job Safety and Health Protection poster.
.9 Daily clean up.
.10 Hazard Communication Program with MSDS logged and maintained.
.11 Daily diary of work, issues, and incidents, etc.
.12 Sheeting, shoring and excavation protection plan.
.13 GFI safety program.
.14 Hazardous Energy Control lock out tag out program.
.15 Required safety clothes; eye & ear protection, respirators, boots, belts, gloves, etc. as appropriate to the Contractor's trade.
.16 Fire Extinguishers.
.17 Removable guard rail protection at material loading areas with a 200 lb. minimum force requirement.
.18 Requirement that all stairs and platforms must have railings with a 200 lb. minimum force requirement. Stair pans and landings must be filled prior to their use.
.91 Plan for daily inspection of tools and equipment, verifying safety devices are operational.
.20 Ladder usage plan.
.21 Weekly toolbox meetings, documented and signed by each employee.
.22 Temporary heat procedures.
.23 The requirement that all individuals on the site wear identifying hard hats at all times.

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.24 The General Contractor, at the General Contractor's cost, shall provide a third party site safety inspection report monthly, and promptly remedy all issues noted in the report.

§ 10.1.1.5 Contractor shall maintain and submit a complete copy of the written safety plan, logs, diaries, plans and programs on site for the Construction Manager.

§10.1.2 Safety

§10.1.2.1 Without limiting any other provisions regarding safety in the Contract Documents or under law, the Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury, or loss to employees on the Work and other persons who may be affected thereby, and the Work and materials and equipment to be incorporated therein, with respect to the Work. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons and property and their protection from damage, injury or loss, specifically including all measures necessary and as may be required to comply with the Guidance and Directives from the Commonwealth of Pennsylvania, the Centers for Disease Control and Prevention (CDC), and any other governmental agency, relating to and arising from any public health emergency. The Contractor acknowledges and agrees that the Guidance and Guidelines referenced herein may be revised and updated from time to time, and Contractor agrees to comply with any such revisions and updates.

§10.1.2.2 When requested by the Owner, Construction Manager, or Architect, the Contractor agrees to submit to Owner a copy of Contractor's written plan for complying with the Guidelines and Guidance Documents referenced herein, including any mitigation measures to protect the health and safety of Contractor's employees and the general public, as well as the Directive(s) of the Pennsylvania Governor, as may be updated from time to time. Submission of the plan to Owner shall not impose upon or establish for Owner any responsibility or obligation for Contractor's work environment or work-site safety, as such responsibility and obligation is solely upon the Contractor.

§10.1.2.3 The General Contractor will serve as the overall Project Safety Coordinator and shall be responsible for coordinating all issues of safety and protection. This responsibility does not diminish each Prime Contractor's individual safety responsibilities pursuant to the Contract Document. Each Prime Contractor shall also designate a safety representative to be onsite from issuance of the Notice to Proceed to contract completion. The designated safety person shall be responsible for the safety of Contractor's Work and construction means and methods of Contractor, Subcontractor, suppliers, and their respective workers, agents, and representatives. The designated safety representative shall make continuous inspections for all safety issues relating to Contractor's Work. None of the Owner, Architect, or Construction Manager are responsible for safety on this Project but will endeavor to promote safety. Each Contractor must comply with Project safety requirements in addition to OSHA and local agency requirements. Failure to comply with safety issues will be grounds for withholding payments and may be considered a material default, in Owner's discretion.

§10.1.2.3.1 The General Contractor shall be responsible for the immediate investigation and resolution of all safety and environmental complaints/issues generated by Contractor employees, Owner, Owner's representatives, or members of the public.

§10.1.2.3.2 The General Contractor shall maintain all egress routes throughout the site. General Contractor shall post exit signs as coordinated with the Construction Manager. General Contractor shall provide wall hung fire extinguishers throughout building as deemed necessary by Construction Manager and fire officials.

§10.1.2.3.3 The General Contractor shall submit to Construction Manager a copy of all licenses (welding, power-nailer, asbestos, etc.) as required by applicable agencies.

§10.1.2.3.4 The General Contractor shall maintain all egress routes throughout the site and shall supply (2) two OSHA-approved means of access/egress to each floor and roof for the course of the entire Project for use by all applicable parties. The General Contractor shall erect and maintain OSHA-approved pedestrian walking bridges for emergency access/egress and as necessary to protect personnel from overhead work.

§10.1.2.3.5 In coordination with the Construction Manager, the General Contractor shall provide, maintain, relocate, and remove a six (6) foot minimum height chain link perimeter security fence. The fence shall surround the

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building and proposed parking areas and will have signage attached at fifty foot intervals advising "Construction Area – Please Keep Out."

§10.1.2.3.6 The General Contractor shall be responsible for opening and securing the site each working day and securing the site at the end of each workday by an effective means and maintaining such protection until all notified by the Construction Manager.

§10.1.2.3.7 The General Contractor shall be responsible for providing and maintaining all temporary emergency egress routes. The General Contractor shall obtain the approval of the applicable local authorities for all temporary emergency egress routes. The General Contractor shall provide for fire separation walls between occupied areas and work areas as required by local officials.

§10.1.2.4 Contractor will comply with all reasonable requests of the Owner and Construction Manager with respect to additional security and protections required for Work interfacing with Owner's operations. All issues related to safety and protection of the site and Owner's operations, staff, and students may be treated as emergency needs, in the Owner's sole discretion, and will not be subject to the 7 day notice requirements of Section 2.5 and Article 14.

§10.1.2.5 Adequate protection will be installed around the entire area of any and all earthwork, trenches, excavations, etc. and will be maintained until the Work is complete.

§10.1.2.5 Hot work permits will be issued by the authority having jurisdiction for all activities involving open flame. The General Contractor will provide a copy of Hot Work Permit Forms.

§10.1.2.6 The Contractor's safety representative shall perform a daily safety inspection walkthrough to ensure that all requirements of the OSHA Standards, Fire Protection Standards and Safe Work Practices are being complied with and/or corrected. It is Contractor's responsibility to provide a safe and healthy work environment for construction personnel, Owner's personnel and representative, and the public.

§10.1.2.7 Upon receipt of written safety concerns and/or issues, the Contractor shall respond in writing addressing how the safety concerns or issues were resolved, copying. The Construction Manager shall be copied on all safety-related correspondence.

§10.1.2.8 The Contractor shall respond to and comply with notices of applicable authorities identifying safety deficiencies. Failure to comply will be grounds for withholding of progress payments until the conditions are acceptable to citing authority with jurisdiction.

§10.1.2.9 The proper execution of the required safety provisions is directly related to the general condition safety line item on the schedule of values. The Contractor's failure to provide a competent safety representative at all times onsite to properly identify and take immediate corrective action may result in deductions to the general condition safety line item of the schedule of values.

§10.1.2.10 The Contractor shall have all required personal protective equipment and materials available for and used by each employee as required by Federal, State, and local guidelines.

§10.1.2.11 The Contractor shall supply proper equipment and crew sizes as necessary to safely complete the Work.

§10.1.2.12 Each Prime Contractor shall provide, relocate and/or maintain barricades, signage, provide flagmen, etc. as necessary to ensure public safety and safe egress.

§10.1.2.13 The Contractor shall notify the Construction Manager immediately upon the arrival of OSHA to the site.

§10.1.2.14 For the safety of occupants, staff, and the public, the steel erection must be scheduled and coordinated with the Owner and Construction Manager. The swinging of steel and the crane boom over occupied space will not be allowed. The General Contractor shall provide adequate barricades and fencing around the crane and steel at all times.

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§10.1.2.15 The speed limit within the Project property is 5 MPH. Contractor employees operating vehicles in excess of the speed limit or in any otherwise unsafe manner will be directed to leave the site and not permitted to return.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work, the Owner's employees, representatives, and building occupants, and other persons who may be affected by the Work or the Contractor's operations;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction;

.4 construction or operations by the Owner, Separate Contractors, or other Prime Contractors, Subcontractors, or Sub-subcontractors; and

.5 any other real or personal property of the Owner.

§ 10.2.2 The Contractor shall comply with, and give notices or reports required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss. If the Contractor fails to give such notices, or fails to comply with such laws, statutes, ordinances, codes, rules, regulations, and lawful orders of public authorities, Contractor shall be liable for and shall indemnify, defend, and hold harmless Owner, Architect, and Construction Manager, and their respective employees, officers and agents, against any resulting fines, penalties, judgments, or damages, including reasonable attorney's fees imposed on or incurred by the parties indemnified hereunder.

§ 10.2.2.1 The Contractor shall comply with Pennsylvania Act 187 of 1996 to call Pennsylvania One Call System, Inc. (800) 242-1776 prior to digging, excavating, or moving earth on the Project. The Contractor shall contract for the services of a qualified agency to assist in locating utilities on site not covered under Pennsylvania One Call System, Inc.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall provide reasonable advance notice to the Owner and Construction Manager and exercise utmost care and carry on such activities under supervision of properly qualified personnel. Any Work approved must be in strict compliance with state and local regulations.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.7.1 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services and shall comply with all reasonable recommendations of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

§ 10.2.7.2 The Contractor shall at all times protect excavations, trenches, buildings, and materials from rainwater, ground water, back up or leakage of sewers, drainage, or other piping, and from water of any other origin, and shall remove promptly any accumulation of water from the Project site. Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

§ 10.2.7.3 The Contractor shall remove snow or ice from the Project site which may result in damage or delay.

§ 10.2.7.4 The Contractor shall take all precautions necessary to prevent loss or damage caused by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner, whether forming part of the Work, located within those areas of the Project to which the Contractor has access. The Contractor shall have full responsibility for the security of such property of the Owner located in such areas and shall reimburse the Owner for any such loss, damage, or injury, except such as may be directly caused by agents or employees of the Owner.

§ 10.2.8 Injury or Damage to Person or Property

§ 10.2.8.1 If the Contractor suffers injury or damage to person or property because of an act or omission of another party, written notice of the injury or damage, whether or not insured, shall be given to the Owner and Construction Manager within a reasonable time not exceeding 21 days after first observance, otherwise, such claim shall be deemed waited by the Contractor. The notice shall provide sufficient detail to enable the other party to investigate the matter. The Owner shall not be responsible for actions or inactions of other Prime Contractors or their Subcontractors.

§ 10.2.8.2 The Contractor shall promptly report in writing to the Owner, Construction Manager and Architect all accidents arising out of or in connection with the Work which caused death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injury, or serious property damage is caused, the accident shall be reported immediately by telephone or messenger to the Owner, Construction Manager and Architect.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a hazardous material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed consultant to verify the presence or absence of the hazardous material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. When the hazardous material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately.

§ 10.3.3 To the extent covered by the Owner's applicable insurance policies, the Owner shall indemnify, defend, and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and

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employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if, and only if, in fact the hazardous material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless by the Owner after receipt of notice from Contractor of the same, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is not due to the fault or negligence of the party seeking indemnity or a party other than the Owner.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 Intentionally deleted.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act to prevent threatened damage, injury, or loss and shall immediately notify the Owner, Construction Manager, Architect, and appropriate public safety authorities (i.e., police, EMS, fire service, etc.). Extensions of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7. Following an emergency affecting the safety of persons or property, the Contractor shall submit to Construction Manager, within 24 hours, a complete written accident report detailing the circumstances which caused the accident; extent of personal injuries; the extent of damage to the Work, real property, or personal property; the time of the accident; and the corrective action required.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents effective from the date of signing of the Agreement until 90 days after final payment except as otherwise provided below. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the Commonwealth of Pennsylvania and have an A- or better, or financial rating of X or better with the A.M. Best's Company Key Rating, Guide - Latest Edition and being, satisfactory to Owner and Architect, and which are licensed to practice business in the Commonwealth of Pennsylvania. The Contractor shall obtain insurance for protection from claims under workers' compensation acts and other employee benefits acts which are applicable, claims for damages because of bodily injury, including, without limitation, death, and claims for damages, other than to the Work itself, to property which may arise out of or result from the Contractor's operations or completed operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable. Contractor is responsible to pay any and all deductibles and/or self-insured retentions that may apply to the required insurance. The Contractor shall include the Owner, Construction Manager and Construction Manager's consultants, the Commonwealth of Pennsylvania, Delaware County Conservation District, municipalities having jurisdiction, and the Architect and Architect's consultants, as additional insureds under the Contractor's insurance policies, except for workers' compensation, or as otherwise described in the Contract Documents. All of the Contractor's insurance policies and the Certificates of Insurance shall state that such insurance is primary and non-contributory with respect to any other valid and collectible insurance policies. The Owner and the Contractor each intend that the policies provided in response to this Section 11.1 shall protect all of the parties insured and provide primary and non-contributory coverage for losses and damages caused by the perils covered thereby. Accordingly, such policies shall state that in the event of payment of loss or damage, the insurer shall have no right of recovery against the parties named as insureds or additional insureds.

§ 11.1.1.1 Contractor shall submit to the Owner an appropriate Certificate of Insurance within the time required by the Instructions to Bidders which certifies that the Contractor is covered by insurance requirements of this Article 11.

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Further, Contractor fully understands that failure to timely submit the Certificate of Insurance shall give the Owner the option to withdraw the award and forfeit the Bidder's Bid Bond.

§ 11.1.1.2 The insurance required by this Section 11.1 shall be written for not less than limits of liability specified in the Contract Documents as set forth in Section 11.1.1.3 below or required by law, whichever coverage is greater. Coverages must be written on an occurrence basis with the exception of professional and environmental/pollution liability that may be written on a "claims-made" basis, and shall be maintained without interruption from the date of signing of the Agreement until 90 days after the date of final payment and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's products and completed operations, and any coverage written on a claims-made basis, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. If any such insurance is due to expire during the required coverage period, the Contractor shall not permit the coverage to lapse and shall furnish evidence of continued coverage to the Owner and the Architect for record. The minimum coverage limits set forth herein shall be subject to periodic review, and Owner reserves the right to require that the Contractor increase the minimum coverage limits if, in the reasonable opinion of Owner, the minimum coverage limits become inadequate.

§ 11.1.1.3 The Contractor shall provide Commercial General Liability including, without limitation, coverage for direct operations, sublet work, personal and advertising injury, bodily injury, property damage with explosion, collapse, and underground hazard coverage (X, C, U) contractual liability, products and completed operations with limits not less than those stated below.

.1	General Aggregate per project (Other than Products and Completed Operations)	$2,000,000
.2	Products and Completed Operations Aggregate	$1,000,000
.3	Personal and Advertising Injury	$1,000,000
.4	Each Occurrence	$1,000,000

.5 Products and Completed Operations Insurance shall be maintained for a minimum period of two (2) years after final payment, and the Contractor shall continue to provide evidence of such coverage to the Owner on an annual basis during the aforementioned period.

§ 11.1.1.4 The Contractor shall provide comprehensive automobile liability insurance including, without limitation, coverage for owned, non-owned, and hired vehicles with limits not less $1,000,000 for each occurrence, bodily injury and property damage combined.

§ 11.1.1.5 The Contractor shall provide an umbrella excess liability policy written on an excess basis with minimum coverage limits not less than $10,000,000 for each occurrence and $10,000,000 in the aggregate which provides excess coverage over all underlying insurance policies. The umbrella excess liability policy shall include, without limitation, a follow form aggregate provision. Insurance requirements hereunder shall not be deemed a cap or limitation on Contractor's liability hereunder.

§ 11.1.1.6 The Contractor shall provide insurance covering losses caused by pollution incidents in limits not less than those listed below, that arise from the operations of the Contractor. Insurance shall apply to bodily injury, property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims.

For General Contracts, Contractor's Pollution Liability:	$1,000,000 per claim $1,000,000 aggregate
For HVAC, Plumbing and Electrical Contracts, Contractor's Pollution Liability:	$100,000 per claim $100,000 aggregate

§ 11.1.1.7 The Contractor shall provide Workers' Compensation in the amounts and coverage as required by Commonwealth of Pennsylvania Workers' Compensation laws and Employers Liability with the following minimum limits:

.1	Each accident	$1,000,000

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.2	Disease, each employee	$1,000,000
.3	Disease, policy limit	$1,000,000

§ 11.1.1.8 If the Contractor stores Work offsite, the Contractor shall provide insurance coverage for portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also for portions of the Work in transit.

§ 11.1.1.9 None of the requirements contained herein as to the types, limits, or Owner's approval of insurance coverage to be maintained by Contractor are intended to and shall not in any manner, limit, qualify, or quantify the liabilities and obligations assumed by Contractor under the Contract Documents, any other agreement with the Owner, or otherwise provided by law.

§ 11.1.1.10 Failure of Contractor to provide insurance as herein required or failure of Owner to require evidence of insurance or to notify Contractor of any breach by Contractor of the requirements of this Section shall not be deemed to be a waiver of any of the terms of the Contract Documents, nor shall they be deemed to be a waiver of the obligation of the Contractor to defend, indemnify, and hold harmless the indemnified parties as required herein. The obligation to procure and maintain any insurance required is a separate responsibility of Contractor and independent of the duty to furnish a copy or certificate of such insurance policies.

§ 11.1.1.11 Contractor's commercial general liability and property damage policy in conjunction with any umbrella or excess liability policy or policies, shall not contain exclusions relating to (a) gravity related injuries; (b) injuries sustained by an employee of an insured or any additional insured; (c) height limitations; (d) residential exclusions, if applicable; (e) cross-party liability; or (f) any exclusion relating to the Work being performed by the Contractor or the Project as a whole, without the express consent of the Owner.

§ 11.1.2 Contractor's Performance Bond and Payment Bond. The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents covering the Contractor's faithful performance of the Contract and payment of obligations arising thereunder. The Contractor shall purchase and maintain the required bonds from a company or companies acceptable to the Owner and lawfully authorized to issue surety bonds in the Commonwealth of Pennsylvania, and the cost thereof shall be included in the Contract Sum. The amount of each Payment Bond and Performance Bond shall be equal to one hundred percent (100%) of the Contract Sum. The forms contained in the Bidding Documents must be used. Other forms of bonds will not be accepted. The carriers from whom the Contractor has purchased bonds must be listed in the most recent U.S. Treasury Department Circular 570 and authorized to conduct business in the Commonwealth of Pennsylvania with an AM Best Rating or "A-" or better and financial rating of Class "X" or higher. The amount of said bonds in question must not exceed the acceptable limit in accordance with the ratings of the surety company. The Contractor shall provide bonds in accordance with the Public Works Contracts Bond Law of 1967, 8 P.S. Sec. 191, et seq. The bonds shall be solely for the protection of the Owner or its assignee. The Surety's liability under the bonds shall be the same as the Contractor's liability.

§ 11.1.2.1 The Contractor shall deliver the required Payment Bond and Performance Bond to the Owner not later than ten (10) days after receipt of Notice of Intent to Award.

§ 11.1.2.2 The Attorney-in-Fact who executes the Performance and Payment Bonds on behalf of the surety shall affix to the bonds a certified and current copy of its Power of Attorney, authorizing said Attorney-in-Fact to act on behalf of the surety. The Power of Attorney must be dated the same day as the bonds and both the bonds and Power of Attorney shall have affixed the raised corporate seal of the surety.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished. Owner may provide a copy of Contractor's Payment Bond to any person or entity appearing to be a potential beneficiary thereunder.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance.

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§ 11.1.4.1 Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, Construction Manager, and Architect, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.1.4.2 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire without written notice to Owner at least thirty (30) business days prior to said cancellation and expiration. Written notice shall be provided to the Owner in compliance with this Section 11.1.4 in the event the Contractor's insurance expires or is cancelled within the time specified in Section 11.1.1. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by this Section 11.1. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness. If this insurance is written on the Comprehensive General Liability policy form, the Certificates shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD Form 25 will be acceptable. Language such as "will endeavor to mail..." or ."..but failure to mail...shall impose no obligation or liability...upon the company, its agents or representatives..." is not acceptable within the Cancellation Clause and should be stricken therefrom.

§ 11.1.4.3 Contractor shall require all Subcontractors to carry similar insurance coverages and limits of liability as required under this Article 11, adjusted to the nature of Subcontractor's operations, and submit same to Owner for approval before any personnel or equipment is brought onto the site.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain property insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.1.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.2 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project. The Contractor shall be solely liable for paying the deductible on the Owner's builder's risk insurance for the Project for any claims relating to the Contractor's Work.

§ 11.2.1.2 Property insurance shall be on an "all-risk" or equivalent policy form and shall insure against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect's, Contractor's, and Construction Manager's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise specifically provided in the Contract Documents.

§ 11.2.2 Failure to Purchase Required Property Insurance.

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Intentionally deleted.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance.
Intentionally deleted.

§ 11.2.4 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance.

§ 11.2.5 The insurance required by this Section 11.2 is not intended to cover machinery, tools or equipment owned or rented by the Contractor which are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance coverage for owned or rented machinery, tools, or equipment.

§ 11.3 Waivers of Subrogation
§ 11.3.1 Intentionally deleted.

§ 11.3.2 Intentionally deleted.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance
Intentionally deleted.

§ 11.5 Adjustment and Settlement of Insured Loss
§ 11.5.1 Intentionally deleted.

§ 11.5.2 Intentionally deleted.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK
§ 12.1 Uncovering of Work
§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time or Contract Sum.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense unless the condition was caused by one of the other Prime Contractors in which event the other Prime Contractor shall be responsible for payment of such costs.

§ 12.2 Correction of Work
§ 12.2.1 Before Substantial Completion
The Contractor shall promptly correct Work rejected by the Construction Manager, Owner, or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed, or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.1.1 Work that is rejected or fails to conform to the requirements of the Contract Documents that requires any review, research, recommendation, meetings or direction by the Architect, any other consultants, or the Construction Manager, in order to substantiate the same or to approve remedies or alternate solutions will be subject to Section

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12.2.1. The Architect, any consultants, and the Construction Manager, will be compensated for such additional Work at the prevailing rates by the Owner, who will be entitled to back charge the Contractor for such fees, as well as any legal fees, professional fees, other expenses, or costs incurred. The Owner may deduct the same from any Application for Payment or any amount of retainage.

§ 12.2.1.2 If prior to the date of Substantial Completion, the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within two years after the date of Substantial Completion of the entire Project, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The obligations under Section 12.2.2 shall survive acceptances of the Work under the Contract and termination or expiration of the Agreement. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5. Nothing contained in Section 12.2.2 shall decrease the liability of the Contractor and its Surety as set for the in the Performance Bond and/or as required by law.

§ 12.2.2.2 The two-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The two-year period for correction of Work shall be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 2.5. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the salvageable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within 10 days after written notice, the Owner may, upon 10 additional days' written notice, sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby, and attorneys' and accountants' fees and expenses. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Prime Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the two-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

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§ 12.2.6 The obligations under Section 12.2 shall cover any repairs and replacement to any part of the Work or other property caused by the defective Work.

§ 12.2.7 The Contractor will be responsible for any expense of the Owner incurred by said uncovering or repair including, but not limited to, legal fees, professional fees, other expenses, or costs.

§ 12.2.8 Upon request by the Owner and prior to the expiration of 2 year from the date of Substantial Completion, the Architect, Construction Manager, and Contractor shall schedule and attend a meeting with the Owner to review the facilities operations and performance.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the Commonwealth of Pennsylvania without regard to conflicts of law.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.3.3 In the event the Contractor should breach any obligation imposed by the Contract Documents, in addition to all other damages, losses, costs and relief, whether in law or equity, which the Owner may recover, the Owner shall also be entitled to an award for any reasonable legal fees and costs, expert fees, and consultant fees, incurred in attempting to enforce or recover under the Contract Documents by reason of the Contractor's breach.

§ 13.3.4 In the event that the Owner declares the Contractor in default and the Contractor's Surety fails to adhere to its obligations under the Performance Bond or Payment Bond, the Surety shall be liable to the Owner for any and all damages that the Owner incurs including, but not limited to, any attorney's fees, consultant fees, and/or other costs or expenses incurred by the Owner in connection with the Owner's pursuit of its rights under the Performance Bond, and Payment Bond.

§ 13.3.5 To the extent any Contractor sues the Owner, and the Owner prevails in such litigation, the Contractor shall be liable to Owner for all of the Owner's costs and expenses including but not limited to, any and all attorney's fees and costs, expert fees, and consultant fees.

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§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. The Contractor shall make arrangements for and conduct or obtain such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals, including, without limitation, the cost of retesting for verification of compliance if necessary, until the Architect and/or the Construction Manager certify(ies) that the Work in question does comply with the requirements of the Contract Documents, and all such costs shall be included in the Contract Sum. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after the Bids are received. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require. At the Owner's option, the Owner may retain a field-testing agency or other testing agencies for this Project, as the Owner deems necessary, in its sole discretion.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense. At the Owner's option, the Owner may retain a separate entity to perform the additional testing, inspection, or approval not included under Section 13.4.1.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense. Such amounts will be deducted, to the extent available, from any amount due the Contractor. If the amount due the Contractor is not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate of 3% simple interest per annum, as set for the in Article 5.3 of the AIA, A132-2019, Standard Form of Agreement between Owner and Contractor.

§ 13.6 Interpretations

§13.6.1 The captions and headings of various Articles and Section in the Contract Documents are for convenience only and are not to be construed as defining or limiting, in any way, the scope or intent of the provisions hereof.

§ 13.6.2 The invalidity of any covenant, restriction, condition, limitation or any other part or provision of the Contract Documents shall not impair or affect in any manner the validity, enforceability, or effect of the remainder of the Contract Documents.

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§ 13.6.3 References to Sections or paragraphs shall also be deemed to include the respective Subparagraphs.

§ 13.6.4 The parties hereto expressly waive the defense of contra proferentem, i.e., that the Contract Documents or any portion of the Contract Documents may be construed against any party as the drafter thereof.

§ 13.7 Employment Policies

§ 13.7.1 The Contractor shall maintain policies of employment as follows:

§ 13.7.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, gender identity, national origin, or any other status protected under applicable law. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, sexual orientation, gender identity, national origin, or other protected status. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment, or recruitment advertising; lay-off or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination.

§ 13.7.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, sexual orientation, gender identity, or national origin.

§ 13.8 Owner's Right to Attorney's Fees and Costs

§ 13.8.1 In the event Contractor institutes legal proceeding against Owner and Owner subsequently prevails in said legal proceedings, Owner shall be entitled to payment by Contractor of all reasonable professional fees, including attorney's fees, Architectural fees, Construction Management fees, engineering fees, consulting fees (together with reasonable expenses and disbursements incurred in connection therewith) which the Owner may incur in connection with said legal proceedings (including professional fees rendered in anticipation of such proceedings). Owner's right to such costs and expenses shall apply to, but not be limited to, any unsuccessful challenge brought by a Bidder to Owner's award of a Contract to another Bidder. This provision shall create no right to the Contractor or any other person or entity for payment of such costs or expenses.

§ 13.8.2 In the event the Contractor should breach any obligation imposed by the Contract Documents, in addition to all other damages, losses, costs and relief, whether in law or equity, which the Owner may recover, the Owner shall also be entitled to an award for any reasonable attorney's fees and costs and consultant fees incurred in enforcing or recovering under the Contract Documents by reason of the Contractor's breach.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 Intentionally deleted.

- **.1** Intentionally deleted.
- **.2** Intentionally deleted.
- **.3** Intentionally deleted.
- **.4** Intentionally deleted.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days for completion, or 120 days in any 365 day period, whichever is less.

§ 14.1.3 If the conditions described in Section 14.1.2 exist, the Contractor may, upon 14 days' notice to the Owner, Construction Manager, and Architect, terminate the Contract and recover from the Owner payment for Work executed and direct damages resulting from the termination, excluding field and office overhead or profit (e.g., expected or actual profit) for Work not executed.

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§ 14.1.4 Intentionally deleted.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** refuses or fails to supply enough properly skilled workers, proper materials, and/or equipment;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- **.4** otherwise materially breaches of a provision of the Contract Documents;
- **.5** submits an Application for Payment, sworn statement, Waiver of Lien, Affidavit, or document of any nature whatsoever which it intentionally falsified; or
- **.6** institutes proceedings or consent to proceedings requesting relief or arrangement under the Federal Bankruptcy Code or any similar or applicable federal or state law; or if a Petition under any federal or state Bankruptcy or Insolvency Law against the Contractor and such Petition is not dismissed within 60 days of the day of said filing; or if the Contractor admits, in writing, its inability to pay its debts generally if they become due, or if Contractor makes a general assignment for the benefit of the creditors, or if a Receiver, Liquidator, Trustee or Assignee is appointed on account of Contractor's bankruptcy or insolvency; or if the Receiver of all or any substantial portion of the Contractor's property is appointed.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate the Contract and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds all costs to the Owner of completing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor less Owner's costs for completing the Work as of the date of termination. If such costs and damages to the Owner of completing the Work exceed the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner immediately upon Owner's demand. The cost to the Owner of completing the Work shall include (but not be limited to) the cost of any additional architectural, construction management, managerial and administrative services required thereby, any costs incurred in retaining another Contractor or other Subcontractor to complete the Work, any additional interest or fees which the Owner may incur by reason of the delay in completion of the Work, attorney's fees and expenses incurred by the Owner, and any other damage, costs and expenses which Owner may incur by reason of completing the Work or any delay thereof. The amount, if any, to be paid to the Contractor shall be certified by the Architect upon application, in the manner provided in Article 9.4.

§ 14.2.5 Notwithstanding any other provision of the Contract Documents to the contrary, in the event that the Contractor abandons its Work on the Project, as determined by the Owner in its sole discretion, and the Contractor does not resume its Work after 72 hours prior written notice from the Owner, the Owner may terminate the Contractor for cause without such termination being subject to the Initial Decision Maker's certification required by Section 14.2.2. The Owner's rights set forth in this Section 14.2.5 shall be in addition to all other rights of the Owner granted in the Contract Documents, at law, or in equity.

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§ 14.2.6 In the event the Owner elects to terminate the Contractor for cause, the Owner may recover against the Contractor and Surety as part of its damages any and all legal fees, professional fees, jointly and severally, including, but not limited to, Architectural fees, Construction Management fees, expert witness and consultant fees, legal fees, and all other costs and expenses related thereto. The Owner shall have the right to set off said amounts against any amount alleged to be due and owing to the Contractor on the base amount of the Contract. Further, should the Contractor fail to achieve Final Completion promptly, upon written recommendation by the Architect and upon notice to the Contractor and after reasonable opportunity to cure, the Owner may, for cause, terminate the Contractor, complete the Work, and recover against the Contractor or Surety, any and all amounts that the Owner incurs, including, but not limited to, any and all legal fees, professional fees and all other costs and expenses related thereto. This provision shall create no right to the Contractor or to any other person or entity for payment of such costs or expenses.

§ 14.2.7 In the event that the Owner declares the Contractor in default and the Contractor's Surety fails to adhere to its obligations under the Performance Bond and Payment Bond, the Surety shall be liable to the Owner for any and all damages that the Owner incurs including, but not limited to, any legal fees, professional fees, or other costs or expenses incurred by the Owner in connection with the Owner's pursuit of its rights under the Performance Bond and Payment Bond and/or applicable law, including, but not limited to, the cost of all litigation, legal fees, professional fees, and all other costs and expenses.

§ 14.2.8 In the event that the Owner terminates the Contract for cause pursuant to Section 14.2 and a court of competent jurisdiction determines that cause for termination did not exist, then the termination shall be treated as a termination for convenience pursuant to Section 14.4 and the Contractor shall be compensated in accordance with Section 14.4.3.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for documented increases in the cost and time pursuant to Section 8.3.1 caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work completed by the Contractor in accordance with the Contract Documents. The Contractor shall not be entitled to receive more than $10,000 for compensation, including, without limitation, for field and office overhead or profit (e.g., expected or actual profit) for Work not executed, termination expenses, or damages. In case of such termination of the Contract for the Owner's convenience, Contractor shall be entitled to receive payment from the Owner only for Work which has been certified by the Architect as having been completed by the Contractor.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also

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includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

§ 15.1.2.1 The Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the Owner arising out of or related to the Contract within the time period specified by applicable law, unless a shorter time applies in accordance with the terms of this Agreement.

§ 15.1.2.2 The Owner reserves all rights and privileges applicable to Owner pursuant to the Doctrine of Nullum Tempus Occurrit Regi (""Doctrine"") and said Doctrine shall be applicable to all claims and causes of action of Owner against Contractor and the Contractor's Surety.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Except as provided herein, claims by the Contractor shall be initiated by written notice to the Owner and to the Initial Decision Maker with a copy sent to the Construction Manager. Claims by the Contractor under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later. The Contractor shall provide written notice of the claim to the Owner in accordance with the requirements set forth herein. The words "written notice" shall be defined as a letter of claim with a title or a caption stating, "Notice of Claim" and shall provide a description of the claim, shall reference related correspondence and/or directives and/or other relevant documents, and the cost and/or time impact of the claim to the Contractor. Provided however, that Claims by the Owner or the Contractor arising from or relating to the Owner's termination of the Contractor's services under Article 14 of this Agreement shall neither be submitted to, nor shall be subject to initial review and decision by, the Initial Decision Maker. If not resolved by the parties, such Claims shall be subject to dispute resolution under the further provisions of this Article 15.

§ 15.1.3.2 Intentionally deleted.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments for undisputed amounts in accordance with the Contract Documents.

§ 15.1.4.2 The Architect will prepare Change Orders and will issue a Certificate for Payment or Project Certificate for Payment in accordance with decisions of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided herein shall be given before proceeding to execute the Work. No claims for additional costs will be considered for delays caused by the Contractor or other Contractors, coordination issues, project schedules, phasing sequence, or time extensions due to weather or other unforeseen circumstances. Claims for such delays shall be limited to claims for increase in the Contract Time.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided herein shall be given. The Contractor's Claim shall include an estimate of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. An increase in the Contract Time shall be the sole recourse for delays, disruptions, and/or hindrances in the progress of the Work, as against Owner, Construction Manager, and Architect and shall not entitle Contractor to damages against Owner, Construction Manager, and Architect.

§ 15.1.6.2 No extension of time shall be granted because of seasonal variations in temperature, humidity, or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. Any additional costs of operations

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or conditions shall be the responsibility of the Contractor. If the Contractor elects to submit a request for extension of time due to adverse weather conditions, the Contractor has the burden of proving that the weather conditions exceeded by at least twenty percent (20%) the average of the previous (5) years for the Delaware County area based on historic U.S. Weather Bureau data. Requests for extension of time due to adverse weather conditions must be submitted to the Architect and Construction Manager within (30) days of the date the Contractor feels the adverse weather impact occurred and must include the Contractor's daily reports and a detailed analysis indicating the impact to the critical path on the Contractor's CPM Schedule. Extensions of time will not be granted for the Contractor's failure to consider and account for normal seasonal weather.

§ 15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work, and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

§ 15.1.7 Claims for Consequential Damages and/or Incidental Damages. The Contractor waives all Claims against the Owner for consequential and/or incidental damages arising out of or relating to this Contract. This waiver includes:

.1 consequential damages incurred by the Contractor, including, without limitation, for principal office expenses, including the compensation of personnel stationed there; for losses of use, income, profit, financing, business, and reputation; for loss of management or employee productivity or of the services of such persons; and for loss of actual and expected profit; and

.2 incidental damages incurred by the Contractor including, without limitation, costs resulting from stopping the Work, removing, and transporting the Contractor's property (e.g., the Contractor's equipment, supplies and materials), and storing the Contractor's property (e.g., the Contractor's equipment, supplies and materials) at an alternate location.

This waiver is applicable, without limitation, to all consequential damages and/or incidental damages due to termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents or the Owner's recovery of consequential or incidental damages permitted under applicable laws.

§ 15.1.8 Intentionally deleted..

§ 15.1.9 Claims for Economic Loss

The Contractor shall have no claim or right of recovery of damages against the Owner, the Architect and/or the Construction Manager for economic loss sustained, in whole or in part, by any act or omission of the Owner, the Architect and/or the Construction Manager to the extent that such act or omission constitutes a breach of contract. Specifically, and without limiting the generality of the foregoing, the Contractor shall have no claim against the Owner, the Architect and/or the Construction Manager for economic loss based upon any tort, including, without limitation, negligence, negligent misrepresentation, or any other tort-based theory of liability.

§ 15.2 Initial Decision

§ 15.2.1 Claims between the Owner and the Contractor, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. An initial decision shall be required as a condition precedent to dispute resolution proceedings related to any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with, or seek information from either party, other Contractors or Subcontractors, or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons and the Contractor and the Owner shall equally share the expense relating to the retention of such persons.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Construction Manager of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to the dispute resolution process set forth in the Contract Documents.

§ 15.2.6 When a written decision of the Architect states that (1) the decision is final but subject to litigation and (2) filing of a lawsuit or a claim covered by such decision must be made by the Contractor within 30 days after the date on which the Contractor receives the final written decision, then the Contractor's failure to file suit within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Contractor. If the Architect renders a decision after litigation proceedings have been initiated, such decision may be entered as evidence, but shall not supersede litigation proceedings unless the decision is acceptable to all parties concerned.

§ 15.2.6.1 Intentionally deleted.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety, and request the surety's assistance in resolving the controversy.

§ 15.2.8 Intentionally deleted.

§ 15.2.9 To the extent any Contractor asserts frivolous claims or asserts claims in bad faith, and the Owner incurs any legal fees, professional fees, expert witness fees, expenses, costs (including, but not limited to, employee cost), the Contractor shall be liable for such fees, expenses or costs, and the Contractor shall reimburse the Owner for such legal fees, professional fees, costs and expenses immediately upon demand by the Owner. This provision shall create no right to the Contractor of any other person or entity for payment of such costs or expenses, nor impair Owner's right to these costs under Sections 13.3 and 13.8 of the Contract Documents.

§ 15.3 Mediation

§ 15.3.1 Any claims, disputes, or other matters in question arising out of or related to the Contract, shall be subject to non-binding mediation, but only upon mutual agreement of the Owner and Contractor.

§ 15.3.2 The Owner and Contractor mutually agree to proceed to non-binding mediation, they shall agree upon a forum for the mediation.

§ 15.3.3 Intentionally deleted.

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§ 15.3.4 Intentionally deleted.

§ 15.4 Dispute Resolution

§ 15.4.1 If the Owner and Contractor do not mutually agree to proceed to non-binding mediation, or if the parties do not resolve their dispute in non-binding mediation, then the parties, including the Contractor's surety, agree to have any claims, disputes or other matters in question arising out of or relating to this Agreement, decided by the Court of Common Pleas of Delaware County, Pennsylvania. The parties, including the Contractor's surety, hereby submit to the exclusive jurisdiction of said Court and further agree that the venue of said Court shall be proper in all respects.

§ 15.4.1.1 Intentionally deleted.

§ 15.4.2 Intentionally deleted.

§ 15.4.3 Intentionally deleted.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Intentionally deleted.

§ 15.4.4.2 Intentionally deleted.

§ 15.4.4.3 Intentionally deleted.

ARTICLE 16 STATUTORY REQUIREMENTS AND OTHER PROVISIONS

§ 16.1 The Contractor's attention is directed to the fact that all applicable Federal and State laws, local ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Agreement throughout, and they are deemed to be included in the Agreement the same as though herein written in full.

§ 16.2 Human Relations Act

§ 16.2.1 The provisions of the Pennsylvania Human Relations Act, Act 222 of October 27, 1955 P.L. 744, as amended from time to time (43 P.S. Section 951, et seq.) of the Commonwealth of Pennsylvania prohibits discrimination because of race, color, religious creed, ancestry, age, sex, national origin, or non-job related handicap or disability or the use of a guide or support animal because of blindness, deafness or physical handicap, by employers, employment agencies, labor organizations, contractors and others. The Contractor shall agree to comply with the provisions of the Pennsylvania Human Relations Act, as amended from time to time, which is made part of these General Conditions as if included herein at length. The Contractor's attention is directed to the language of the Commonwealth of Pennsylvania's non-discrimination clause in 16 Pa. Code Section 49.101, et seq., as amended from time to time.

§ 16.3 Prevailing Wage Requirements

§ 16.3.1 The Pennsylvania Prevailing Wage Act (Act No. 442 of 1961, P.L. 987, amended by Act 342 of 1963, P.L. 653), and as amended from time to time (43 P.S. Section 165-1, et seq.), the regulations thereto, and the Prevailing Wage Determination Schedule included in the Contract Documents as Section 007343.16, as determined by the Secretary of Labor and Industry (the "Secretary"), shall be paid for each craft or classification of all workers needed to perform the Contract during the anticipated term therefore in the locality in which the Work is performed, are expressly incorporated in these General Conditions by reference.

§ 16.3.2 The Contractor and Subcontractors shall pay no less than the wage rates (including contributions for employee benefits) as required by the Prevailing Wage Rate Requirements included in the Contract Documents as Section 007343, to any person they respectively employ in the performance of the Work. Employers not parties to a contract requiring contributions for employee benefits which have been determined to be included in the general prevailing minimum wage rate shall pay the monetary equivalent thereof directly to the workers.

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§ 16.3.3 The Contract provisions shall apply to all Work performed on the Contract by the Contractor and to all Work performed on the Contract by all Subcontractors. The Contractor shall insert into each subcontract all of the stipulations contained in these required provisions and such other stipulations as may be required.

§ 16.3.4 The Contractor and all Subcontractors shall keep an accurate record showing the time, craft and/or classification, number of hours worked per day, and the actual hourly rate of wage paid (including employee benefits) to each worker employed by them in connection with the Project and such record must include, without limitation, any deductions from each worker. The record shall be preserved for two (2) years from the date of payment, or as required by Section 3.6.5.1, and shall be open at all reasonable hours to the inspection of the Owner and to the Secretary or the Secretary's duly authorized representatives.

§ 16.3.5 The Contractor and each of its Subcontractors shall comply with the requirements of Specification Section 007343, Prevailing Wage Rate Requirements, for the submission of Prevailing Wage Certification Forms required for this Project.

§ 16.4 PUBLIC WORKS EMPLOYMENT VERIFICATION

§ 16.4.1 Only individuals permitted to work in the United States of America and the Commonwealth of Pennsylvania shall be employed, in any capacity, in the performance of any Work under the Contract. The Contractor shall comply with the provisions of The Public Works Employment Verification Act, including but not limited, to setting forth information regarding the Act's requirements in all contracts with Subcontractors.

§ 16.4.2 The Contractor and every Subcontractor performing Work under the contract shall utilize the E-Verify Program (EVP) operated by the United States Department of Homeland Security to electronically verify the employment eligibility of each new employee hired after January 1, 2013. The Contractor and each of its Subcontractors shall submit to the Construction Manager a separate and complete Verification Form, executed by a representative who has sufficient knowledge and authority to make the representations and certifications contained in the Verification Form, as required by the Public Works Employment Verification Act, Act No. 127, July 5, 2012 (formerly Senate Bill 637), before performing any Work on the Project.

§ 16.4.3 The Contractor, as a precondition of the Contract, shall submit the completed Public Works Employment Verification Form to the Owner along with its Payment Bond, Performance Bond, Certificates of Insurance, and Form Contract.

§ 16.4.4 Each Subcontractor shall submit a completed Public Works Employment Verification Form to the Owner prior to performing work on the Project.

§ 16.4.5 During the term of the Contract, each new employee hired by the Contractor, regardless of whether the employee will be working onsite or offsite of the Project, shall be verified within 5 business days of its or her start date.

§ 16.4.6 During the Project, a new employee hired by a Subcontractor, regardless of whether the employee will be working onsite or offsite of a public work or otherwise, shall be verified within 5 business days of its or her start date.

§ 16.4.7 Subcontracts between the Contractor and its Subcontractors and between Subcontractors of any tier and their Subcontractors are required to contain notification of the applicability of the Act, information regarding the use of EVP and reference to the Department's web site at www.dgs.state.pa.us to obtain a copy of the Form.

§ 16.4.8 The Contractor and each of its Subcontractors shall cooperate with the Department of General Services, Public Works Employment Verification Complaint Office during an investigation or audit arising under the Act.

§ 16.4.9 The Contractor and each of its Subcontractors shall maintain documentation of continued compliance with the Act by utilizing the EVP for new employees hired throughout the duration of the public work contract.

§ 16.5 SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

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§ 16.5.1 The Contractor shall be fully informed of and shall comply with all local, state, and federal regulations for construction as amended to date, as the rules and regulations in detail apply for the Work under the Contract. All applicable rules and regulations of governing bodies are hereby made a part of these General Conditions by reference, as if written out in full within.

§ 16.6 ALUMINUM AND STEEL PRODUCTS

§ 16.6.1 As this Project involves the construction, reconstruction, alteration, repair, improvement or maintenance of "public work," the Contractor shall strictly comply with all requirements of the Pennsylvania Steel Products Procurement Act, 73 P.S. Section 1881, et seq., as amended from time to time with respect to the Work, which shall include, without limitation, using steel, steel products (including machinery and equipment) or cast iron produced in the United States unless otherwise exempted therefrom in the performance of the Contract or any Subcontracts thereunder.

§ 16.6.1.1 "Steel products" are defined as products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two (2) or more of such operations, from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process and shall include cast iron products, machinery and equipment listed in United States Department of Commerce Standard Industrial Classification 25 (furniture and fixture), 35 (machinery, except electrical) and 37 (transportation equipment) and made of, fabricated from, or containing steel components. If a product contains both foreign and United States steel, such product shall be determined to be a United States steel product only if at least seventy-five percent (75%) of the cost of the articles, materials and supplies have been mined, produced, or manufactured, as the case may be, in the United States. Transportation equipment shall be determined to be a United States steel product if it complies with Section 165 of Public Law 97-424 (96 Stat. 2136).

§ 16.6.1.2 In accordance with Act 161 of 1982 (June 18, 1982 P.L. 556) cast iron products shall also be included and produced in the United States. Act 144 of 1984 (July 9, 1984 P.L. 674) further defines "steel products" to include machinery and equipment. Act 142 of 1980 (Oct. 5, 1980 P.L. 693), Act 161 of 1982 and Act 141 of 1984 provide clarifications and penalties and Contractor shall abide by these Acts, as amended from time to time.

§ 16.6.2 In addition to the requirements set forth in Section 16.6.1, the Contractor shall strictly comply with all requirements of the Trade Practices Act, 71 P.S. § 773.101 et seq., which shall include, without limitation, being prohibited from using any aluminum or steel products made in a foreign country which discriminates against aluminum or steel products manufactured in Pennsylvania. The countries of Brazil, South Korea, Spain, and Argentina have been found to discriminate against certain products manufactured in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed herein, for the Project is strictly prohibited.

§ 16.6.2.1 BRAZIL: Welded carbon steel pipes and tubes; carbon steel wire rods; tool steel; certain stainless-steel products, including hot-rolled stainless-steel bar; stainless steel wire rod and cold-formed stainless-steel bar; pre-stressed concrete steel wire strand; hot-rolled carbon steel plate in coil; hot-rolled carbon steel sheet and cold-rolled carbon steel sheets.

§ 16.6.2.2 SPAIN: Certain stainless-steel products, including stainless steel wire rod, hot-rolled stainless-steel bars, and cold-formed stainless-steel bars; pre-stressed concrete steel wire strands, and certain steel products, including hot-rolled steel plate, cold-rolled carbon steel plate, carbon steel structural shapes, galvanized carbon steel sheet, hot-rolled carbon steel bars and cold-formed carbon steel bars.

§ 16.6.2.3 SOUTH KOREA: Welded carbon steel pipes and tubes; hot-rolled carbon steel plate; hot-rolled carbon steel sheet and galvanized steel sheet.

§ 16.6.2.4 ARGENTINA: Carbon steel wire rod and cold-rolled carbon steel sheet.

§ 16.6.2.5 Penalties for violation of the above Sections may be found in the Trade Practices Act, which penalties include becoming ineligible for public works contracts for a period of three years.

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§ 16.6.3 The provisions of Section 16.6 in no way relieves the Contractor of responsibility to comply with those provisions of this Contract which prohibit the use of foreign-made steel and cast-iron products.

§ 16.7 ANTI-POLLUTION LEGISLATION

§ 16.7.1 62 Pa. C.S.A. Section 3301 requires that Bidders on construction contracts for the Commonwealth of Pennsylvania be advised that there are provisions of Federal and State statutes, rules and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources that affect the Project on which Bids are being received.

§ 16.7.2 The Bidder shall become thoroughly acquainted with the terms of the listed statutes, rules and regulations, including, but not limited to, Flood Plain Management Act (32 P.S. Section 679.101, et seq.), Water Well Drillers License Act (32 P.S. Section 645.1, et seq.), Pennsylvania Scenic Rivers Act (32 P.S. Section 820.21, et seq.), Dam Safety and Encroachment Act (32 P.S. Sec. 693.1, et seq.), Bluff Recession and Setback Act (32 P.S. Section 5201, et seq.), Storm Water Management Act (32 P.S. Section 680, et seq.), Pennsylvania Sewage Facilities Act (35 P.S. Section 750.1, et seq.), Pennsylvania Solid Waste Management Act (35 P.S. Section 6018.101, et seq.), Pennsylvania Safe Drinking Water Act (35 P.S. Section 721.1, et seq.), the Clean Streams Law (35 P.S. Section 691.901 et seq. and 35 P.S. Section 691.1 et. seq.), Air Pollution Control Act (35 P.S. Section 4001, et seq.), Pennsylvania Historic Preservation Act (37 Pa. C.S.A. Section 501, et seq.), Pennsylvania Hazardous Sites Clean Up Act (35 P.S. Section 6020.101, et seq.), Pennsylvania Storage Tank and Spill Prevention Act (35 P.S. Sec. 6021.101, et seq.), Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. Sections 9601-9675) as amended, including, but not limited to, the Superfund Amendments and Reauthorization Act (P.L. 99-499), Federal Solid Waste Disposal Act (42 U.S.C. Sections 6901-6992), Federal Clean Air Act (Air Pollution Act) (42 U.S.C. Sections 7401-7671q), Federal Safe Drinking Water Act (See Public Health Service Act Sections 1401-1451) (42 U.S.C. Sections 300f-300j-11), Wild and Scenic River Act (P.L. 90-542), Endangered Species Conservation Act of 1969 (P.L. 89-669), Endangered Species Conservation Act of 1973 (16 U.S.C. Sections 1531-1544), Federal Clean Water Act of 1977 (P.L. 95-217), Rivers and Harbor Act of 1970 (P.L. 91-611), Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. Sections 136-136y), Toxic Substance Control Act (15 U.S.C. Sections 2601-2692), Resource Conservation and Recovery Act of 1976 (42 U.S.C. Sections 6901-6991), Coastal Wetlands Planning, Protection and Restoration Act (16. U.S.C. Sections 3951-3956), Coastal Zone Management Act of 1972 (16 U.S.C. Sections 1451-1464), Community Environmental Response Facilitation Act (42 U.S.C. Section 9620), Emergency Planning and Right-to-Know Act of 1986 (42 U.S.C. Sections 11001-11050), Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. Sections 791-798), Environmental Quality Improvement Act of 1970 (42 U.S.C. Sections 4371-4375), Federal Facility Compliance Act of 1992 (42 U.S.C. Section 6901), Federal Land Policy and Management Act of 1976 (43 U.S.C. Sections 1701-1784), Federal Water Pollution Control Act (33 U.S.C. Sections 1251-1387), Geothermal Energy Research, Development, and Demonstration Act of 1974 (30 U.S.C. Sections 1101-1164), Global Climate Protection Act of 1987 (15 U.S.C. Section 2901 note), Hazardous Substance Response Revenue Act of 1980 (see 26 U.S.C. Sections 4611, 4612, 4661, 4662), Lead-Based Paint Exposure Reduction Act (15 U.S.C. Sections 2681-2692), Lead Contamination Control Act of 1988 (42 U.S.C. Sections 300j-21 to 300j-25), Low-Level Radioactive Waste Policy Act (42 U.S.C. Sections 2021b-2021d), National Climate Program Act (15 U.S.C. Sections 2901-2908), National Contaminated Sediment Assessment and Management Act (33 U.S.C. Section 1271 note), National Environmental Policy Act of 1969 (42 U.S.C. Sections 4321-4370b), National Ocean Pollution Planning Act of 1978 (33 U.S.C. Sections 1701-1709), Noise Control Act of 1972 (42 U.S.C. Sections 4901-4918), Oil Pollution Act of 1990 (33 U.S.C. Sections 2701-2761), Pollution Prevention Act of 1990 (42 U.S.C. Sections 13101-13109), Public Health Service Act (42 U.S.C. Sections 300f-300j-11), Renewable Resources Extension Act of 1978 (16 U.S.C. Sections 1671-1676), Resource Conservation and Recovery Act of 1976 (42 U.S.C. Sections 6901-6991), Soil and Water Resources Conservation Act of 1977 (16 U.S.C. Sections 2001-2009), Water Resources Research Act of 1984 (42 U.S.C. Sections 10301-10309), Wood Residue Utilization Act of 1980 (16 U.S.C. Sections 1681-1687), Pennsylvania Worker and Community Right-to-Know Act (35 P.S. Section 7301, et seq.), Asbestos Hazard Emergency Response Act of 1986 (see Toxic Substances Control Act Sections 201-214) (15 U.S.C. Sections 2651-2654), Delaware River Basin Compact (32 P.S. Section 815.101, et seq.), Brandywine River Valley Compact (32 P.S. Section 818, et seq.), Wheeling Creek Watershed Protection and Flood Prevention District Compact (32 P.S. Section 819, et seq.), Susquehanna River Basin Compact (32 P.S. Section 820.1, et seq.), Chesapeake Bay Commission Agreement (32 P.S. Section 820.11, et seq.), Land and Water Conservation and Reclamation Act (32 P.S. Section 5101, et seq.), Wild Resource Conservation Act (32 P.S. Section 5301, et seq.), Cave Protection Act (32 P.S. Section 5601, et seq.), Rails to Trails Act (32 P.S. Section 5611, et seq.), Phosphate Detergent Act (35 P.S. Section 722.1, et

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seq.), Plumbing System Lead Ban and Notification Act (35 P.S. Section 723.1, et seq.), Publicly Owned Treatment Works Penalty Law (35 P.S. Section 752.1, et seq.), Pennsylvania Solid Waste-Resources Recovery Act (35 P.S. Section 755.1, et seq.), Sewage System Cleaner Control Act (35 P.S. Section 770.01, et seq.), Hazardous Material Emergency Planning and Response Act (35 P.S. Section 6022.101, et seq.), Oil Spill Responder Liability Act (35 P.S. Section 6023.1, et seq.), Land Recycling and Environmental Remediation Standards Act (35 P.S. Section 6026.101, et seq.), Radiation Protection Act (35 P.S. Section 7110.101, et seq.), Low-Level Radioactive Waste Disposal Act (35 P.S. Section 7130.101, et seq.), Pennsylvania Municipalities Planning Code (53 P.S. Section 10101, et seq.), regulations, ordinances, and other actions pursuant to the foregoing, regulations pertaining to Pennsylvania Erosion and Sediment Control, and so on. No separate or additional payment will be made for such compliance. In the event that the listed statutes, rules and regulations are amended, or if new statues, rules or regulations become effective, after date of receipt of Bids, upon receipt of documentation which causes the Contractor to perform additional Work, the Owner may issue a Change Order setting forth the additional Work that must be undertaken and such additional Work shall be undertaken at no additional cost to the Owner. It is also the responsibility of the Contractor to determine what local ordinances, if any, will affect their portion of the Work. The Contractor shall check for any County, City, Borough or Township rules or regulations applicable to the area in which the Project is being constructed and, in addition, for any rules or regulations of other organizations having jurisdiction, including, without limitation, chambers of commerce, planning commissions, industries or utility companies who have jurisdiction over lands which the Contractor occupies. Any costs of compliance with local controls shall be included in the prices bid, even though documents of such local controlling agencies are not listed herein.

§ 16.8 Erosion Control

§ 16.8.1 To the extent the Contractor performs excavation Work, it shall comply with all rules and regulations of Chapter 102, Title 25 of Pennsylvania Soils Erosion and Sedimentation Control (25 Pa. Code Section 102.1, et seq.). Prior to any grading, the Contractor shall be responsible to obtain approval from the Department of Environmental Protection for an approved sedimentation and erosion control site plan for the Project site and shall perform all necessary site work in accordance with said plan. The applicable plan shall be available at the Project site at all times. If the Contractor performs excavation work, it shall maintain all devices as required to control erosion caused by storing water and preventing dust and particles from being distributed off site.

§ 16.8.2 Site Excavation: The Contractor shall:

.1 request the location and type of facility owner lines at the Project site by notifying the facility owner through the One Call System as defined in 73 P.S. § 176. Notification shall be not less than three (3) business days nor more than ten (10) business days in advance of beginning excavation or demolition work. No work shall begin earlier than the scheduled excavation date which shall be on or after the third business day after notification. The scheduled excavation date shall exclude the date upon which notification was received by the One Call System and notification received on a Saturday, Sunday, or holiday, which shall be processed on the following business day. In the case of a complex project as defined in 73 P.S. § 176, notification shall not be less than ten (10) business days in advance of the beginning of excavation or demolition work.

.2 provide the One Call System with specific information to identify the Project site so that facility owners might provide indications of their lines.

.3 take reasonable steps to work with facility owners including, without limitation, scheduling and conducting a preconstruction meeting, so that the Contractor may locate the facilities at a time reasonably in advance of the actual start of excavation or demolition work for each phase of the Work if the Project is a complex project as defined in 73 P.S. § 176 or if an excavation Contractor intends to perform work at multiple sites or over a large area. After commencement of excavation or demolition work, the excavation Contractor shall be responsible for protecting and preserving the staking, marking or other designation until no longer required for proper and safe excavation or demolition work at or near the underground facility, or by contacting the One Call System to request that the facilities be marked again in the event that the previous markings have been compromised or eliminated.

.4 comply with the requirements established by the One Call System as determined by the board of directors regarding the maximum area that a notification may cover.

.5 inform each operator employed by the excavation Contractor at the Project site of the information received with respect to location and type of underground installations and any other information required by 73 P.S. § 176, et. seq.

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.6 report immediately to the Owner, Construction Manager, and the Architect, any break or leak on its lines or any dent, gouge, groove, or other damage to such lines, to their coating or cathodic protection, made or discovered in the course of the excavation or demolition work.

.7 immediately notify 911 and the facility owner if the damage results in the escape of any flammable, toxic or corrosive gas or liquid which endangers life, health, or property.

.8 assist a facility owner in determining involvement of a facility owner's lines by disclosing additional available information requested by the facility owner, including, without limitation, dimensions, and the direction of proposed excavations.

.9 re-notify the One Call System unless other arrangements have been made directly with the facility owners involved at the Project site if the excavation Contractor removes its equipment and vacates the Project site for more than 2 business days.

.10 submit an incident report to the Department of Labor and Industry of the Commonwealth of Pennsylvania not more than 10 business days after striking or otherwise damaging a facility owner's line during excavation or demolition activities that resulted in personal injury or property damage to parties other than the affected excavation Contractor or facility owner.

.11 comply with all requests for information by the Department of Labor and Industry of the Commonwealth of Pennsylvania relating to such Department of Labor and Industry's enforcement authority under the 73 P.S. § 176, et. seq. within 30 days of the receipt of the request.

.12 ensure the accuracy of the information provided to the One Call System pursuant to 73 P.S. § 176, et. seq.

.13 become thoroughly acquainted with and comply with all other terms and conditions specified in 73 P.S. § 176, et. seq., as amended from time to time including, without limitation, the Contractor shall pay all applicable fees.

.14 complete the site excavation in full compliance with all applicable standards, codes, laws, ordinances, regulations and/or requirements of any applicable State, Federal or governmental agency.

§ 16.9 Discrimination

§ 16.9.1 The Contractor agrees:

.1 In the hiring of any employee(s) for the manufacturer of supplies, performance of the Work, or any other activity required under the Contract or any subcontract, the Contractor, Subcontractor, or any person acting on behalf of the Contractor or Subcontractor shall not discriminate, by reason of gender, race, creed, or color, in violation of the *Pennsylvania Human Relations Act* (PHRA) and applicable federal laws against any citizen of the Commonwealth of Pennsylvania who is qualified and available to perform the Work to which the employment relates. (62 Pa. C.S.A. Section 3701).

.2 The Contractor, any Subcontractor, or any person on their behalf shall not in any manner discriminate by reason of gender, race, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against or intimidate any employee involved in the manufacturer of supplies, the performance of Work, or any other activity required under the Contract. (62 Pa. C.S.A. Section 3701).

.3 Neither the Contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate against employees by reason of participation in or decision to refrain from participating in labor activities protected under the Public Employee Relations Act, Pennsylvania Labor Relations Act, or National Labor Relations Act, as applicable and to the extent determined by entities charged with such Acts' enforcement, and shall comply with any provision of law establishing organizations as employees' exclusive representatives.

.4 The Contractor and Subcontractors shall establish and maintain a written nondiscrimination and sexual harassment policy and shall inform their employees in writing of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined. Posting this Nondiscrimination/Sexual Harassment Clause conspicuously in easily accessible and well-lighted places customarily frequented by employees and at or near where the grant services are performed shall satisfy this requirement for employees with an established work site.

.5 The Contractor shall not discriminate by reason of gender, race, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against any Subcontractor or supplier who is qualified to perform the Work to which the Contracts relates.

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.6 The Contractor and each Subcontractor represents that it is presently in compliance with and will maintain compliance with all applicable federal, state, and local laws and regulations relating to nondiscrimination and sexual harassment. The Contractor and each Subcontractor further represents that it has filed a Standard Form 100 Employer Information Report ("EEO-1") with the U.S. Equal Employment Opportunity Commission ("EEOC") and shall file an annual EEO-1 report with the EEOC as required for employers' subject to Title VII of the Civil Rights Act of 1964, as amended, that have 100 or more employees and employers that have federal government contracts or first- tier subcontracts and have 50 or more employees. The Contractor or any subcontractor shall, upon request and within the time periods requested by the Commonwealth, furnish all necessary employment documents and records, including EEO-1 reports, and permit access to their books, records, and accounts by the granting agency and the Bureau of Diversity, Inclusion and Small Business Opportunities, for the purpose of ascertaining compliance with the provisions of this Section 16.9.

.7 The Contractor shall include, without limitation, the provisions of this Section 16.9 in every subcontract so that such provisions will be binding upon each Subcontractor.

.8 The Contractors' obligations pursuant to these provisions are ongoing from and after the effective date of this Contract through the termination date thereof. Accordingly, the Contractor and Subcontractors shall have an obligation to inform the Owner and Commonwealth if, at any time during the term of this Agreement, it becomes aware of any actions or occurrences that would result in violation of these provisions.

.9 The Owner, Commonwealth of Pennsylvania and its agencies may cancel or terminate the Contract for a violation of the terms and conditions of this Section 16.9, and all money due or to become due to the Owner under the Grant may be forfeited for a violation of the terms and conditions of this Section 16.9. In addition, the Commonwealth and its agencies may proceed with debarment or suspension and may place the Contractor and/or Subcontractor in the Contractor Responsibility File.

§ 16.10 Criminal History and Child Protective Services Information

§ 16.10.1 Prior to commencing Work, the Contractor and each Subcontractor shall submit on the prescribed form, for each employee or person performing work at the Project site on behalf of the Contractor and Subcontractor prior to such person performing any work at the Project site, a complete:

.1 Original Pennsylvania and Federal criminal background checks in accordance with Section 111 of the Public School Code of 1949, Act 34 of March 10, 1949, P.L. 30, No. 14, as amended by from time to time including, without limitation, by Act 114 of July 11, 2006, P.L. 1092, and Act 24 of 2011 (P.L. 112, No. 24) (24 P.S. Section 1-111, et seq.), both dated no earlier than one year prior to the date presented to the Owner.

.2 Official clearance statement obtained from the Pennsylvania Department of Public Welfare pursuant to Act 151 of December 16, 1994 (P.L. 1292), subchapter C.2 of the Child Protective Services Law, as amended from time to time, dated no earlier than one year prior to the date presented to the Owner.

.3 The "Commonwealth of Pennsylvania Sexual Misconduct/Abuse Disclosure Release," that has been developed by the Pennsylvania Department of Education, pursuant to Act 168 of 2014, to be used by school entities and independent contractors of school entities and by applicants who would be employed by or in a school entity in a position involving direct contact with children to satisfy the Act's requirement of providing information related to abuse or sexual misconduct.

.4 Properly completed and executed Form PDE-6004. The Contractor and its subcontractors shall refuse to employ any person as an independent contractor or employee whose Federal Criminal History record information indicates that such prospective employee has been convicted of any of the following offenses: (1) An offense identified in Section 1-111 of the Pennsylvania Public School Code, 24 P.S. §1-111, (2) An offense designated as a felony under the act of April 14, 1972 (P.L. 233, No. 64), known as "The Controlled Substance, Drug, Device and Cosmetic Act"; and (3) an out-of-State or Federal offense similar in nature to those crimes listed on Form PDE-6004; and

.5 Any such other clearances as may be required by law.

§ 16.10.2 Owner shall review the submissions prior to each individual being permitted to come onto the Owner's property. The Owner reserves the right to reject any employee, agent, or subcontractor that the Owner determines in its sole discretion has an unsatisfactory criminal history or child abuse clearance. The Owner shall retain a copy of all such clearances in its file. Notwithstanding any other provision of the Contract, violation of this provision shall

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constitute grounds for immediate termination of the contract by the Owner. Any individual rejected by the Owner shall not be permitted on the Owner's property. Owner's right to declare such person unfit shall not be limited to the required exclusion of persons from direct contact with children as set forth in Section 1-111 of the Pennsylvania Public School code and/or subchapter C.2 of the Child Protective Services Law.

§ 16.10.3 The Contractor shall notify the Owner in writing within 72 hours of any person working on the Project under the Contractor's supervision (employee, agent, subcontractor, subcontractor's employee, etc.) is arrested or convicted of an offense listed or referenced in 24 P.S. §1-111 or has an indicated or founded report of child abuse. The Owner shall have the right to prohibit any such individual from coming onto its property.

§ 16.11 Pennsylvania Uniform Construction Code

§ 16.11.1 The Contractor shall comply with all requirements of the Pennsylvania Uniform Construction Code, 35 P.S. § 7210.301 – 7210.304, as amended by S.B. 1139, Session of 2004, as further amended from time to time.

§ 16.12 RIGHT-TO-KNOW LAW

§ 16.12.1 The Contractor shall comply with all requirements of Pennsylvania's Right-To-Know Law, 65 P.S. § 67.101, et seq. ("RTKL"), and as amended

§ 16.12.1.1 Upon notice given by Owner to Contractor that the Owner is in receipt of a Right-to-Know Request (the Request) requesting access to documents related to the Work that are not within the possession of the Owner or Owner's representatives, the Contractor shall provide Owner all documents regarding the Work that are determined by the Owner to be responsive to the Request (the "Record"). The Owner shall determine whether the Record constitutes a Public Record subject to disclosure under the RTKL.

§ 16.12.1.2 Upon receipt of a Request as described under Section 16.12.1.1, Owner will send a copy of the Request to the Contractor within five (5) business days of receipt of the Request for the Record. The Contractor shall provide the Owner with the Record within five (5) business days. The Contractor shall provide such other assistance as the Owner may need in order to comply with the RTKL. The Owner shall deny the Request for the Record or release the Record within the time period allotted by the RTKL.

§ 16.12.1.3 If at any time the Contractor notifies the Owner in a written statement signed by a representative of the Contractor that a document provided by the Contractor to the Owner contains a trade secret or confidential proprietary information, the Owner shall notify the Contractor within five business (5) days of receipt of a Request requesting a Record of the Contractor that contains such information. The Contractor shall have five (5) business days from the receipt of the notice from the Owner to provide input on the release of the Record. Thereafter the Owner will either deny the Request or release the Record and shall notify the Contractor of its decision.

§ 16.12.1.4 If the Owner denies the Request for failure of Contractor to provide the Record, and an appeal is taken from the denial, the Contractor upon demand from the Owner shall indemnify, and hold the Owner harmless from and against any damages, penalties, expenses, legal costs and fees, or other detriment or harm that the Owner may incur in connection with defense of the appeal. If on appeal, a final determination is entered by the Office of Open Records that requires the Owner to provide access to the Record, Contractor shall provide the Owner the Record in accordance with the final determination. Failure to timely provide the Record shall subject the Contractor to the payment of liquidated damages of $800 per day for each calendar day beyond the date the Record was ordered to be released.

§ 16.12.1.5 The Owner will provide the Contractor with reimbursement for costs incurred by Contractor for which Owner is allowed to charge in accordance with and within the scope of permitted costs as set forth in the fee schedule established by the Office of Open Records or as otherwise allowed under the RTKL.

§ 16.12.1.6 The Owner's determination as to whether the Record is a Public Record is dispositive of the question as between the Owner and the Contractor. The Contractor agrees not to challenge the Owner's decision or in any way hold the Owner liable for its decision. Contractor waives all rights or remedies that may be available to Contractor as a result of the Owner's disclosure of Records in response to a RTK Request. The waiver of all rights or remedies shall survive the expiration of the Contract Documents.

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§ 16.13 Contractor Responsibility Provisions

§ 16.13.1 The Contractor shall adhere to the Responsible Contractor Requirements and submit with its Bid the Contractor Responsibility Certification found in Div. 00, Procurement Requirements. The requirements of the Responsible Contractor Requirements and the Contractor Responsibility Certification are incorporated herein as if set forth at length.

§ 16.13.2 The Contractor certifies, for itself and all its Subcontractors, that as of the date of its execution of its Bid and the Contract, that neither the Contractor, nor any Subcontractors, nor any suppliers, are under suspension or debarment by the Commonwealth of Pennsylvania or any governmental entity, instrumentality, or authority and, if the Contractor cannot so certify, then it agrees to submit, along with its Bid, a written explanation of why such certification cannot be made.

§ 16.13.3 The Contractor also certifies, that as of the date of its execution of its Bid and the Contract, it has no tax liabilities or Commonwealth of Pennsylvania obligations.

§ 16.13.4 The Contractor's obligations pursuant to these provisions are ongoing from and after the effective date of the Contract through the termination date thereof. Accordingly, the Contractor shall have an obligation to inform the Owner if, at any time during the term of the Contract, it becomes delinquent in the payment of taxes, or other Commonwealth of Pennsylvania obligations, or if it or any of its Subcontractors are suspended or debarred by the Commonwealth of Pennsylvania, the federal government, or any other state or governmental entity. Such notification shall be made within 7 days of the date of suspension or debarment.

§ 16.13.5 The failure of the Contractor to notify the Owner of its suspension or debarment by the Commonwealth of Pennsylvania, any other state, or the federal government shall constitute an event of default of the Contract with the Owner.

§ 16.13.6 The Contractor agrees to reimburse the Owner for the reasonable costs of investigation incurred by the Owner for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Owner. Such costs shall include, but shall not be limited to, salaries of investigators, including, without limitation, overtime, travel and lodging expenses, legal fees, professional fees, Architect fees, Construction Management fees, expert witness fees, documentary fees and all other costs and expenses related thereto.

§ 16.13.7 The Contractor may obtain a current list of suspended and debarred Commonwealth of Pennsylvania Contractors by either searching the internet at http://www.dgs.state.pa.us/ or contacting the:

Department of General Services
Office of Chief Counsel
603 North Office Building
Harrisburg, PA 17125
Telephone No.: 717-787-6472
FAX No.: 717-787-9138

§ 16.13.7 Without being limited by the specificity of any requirements in the Contract Documents, the Contractor shall strictly comply with all applicable laws, ordinances, rules, orders, mandatory guidance, and regulations of all authorities having jurisdiction over the Project.

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SECTION 00 7343 PREVAILING WAGE RATE REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Prevailing Wage Act.
2. Pennsylvania Prevailing Wage Determination Schedule follows as Section 007346.13.
3. Pennsylvania Department of Labor and Industry “Weekly Payroll Certification for Public Works Projects” Form LLC-25 follows as Section 07346.16.

1.3 Prevailing Wage Rates

A. The provisions of the Pennsylvania Prevailing Wage Act, Act. No. 442, approved August 15, 1961 (P.L. 987) as amended are hereby incorporated herein and the Contractor and all Subcontractors shall comply with the requirements of the applicable portions thereof and the Regulations issued in connection therewith.

B. Pursuant to the requirements of the above Act, the Prevailing Minimum Wage Predetermination is attached hereto and hereby made part of the Contract Documents.

C. The general prevailing minimum wage rates including contributions for employee benefits as shall have been determined by the Secretary of Labor and Industry (hereinafter “Secretary”), which must be paid to the workmen, employed in the performance of the Contract.

D. All Prime Contractors shall submit (3) copies of weekly certification forms with their payment requisitions. The form to be used is the latest edition of the Department of Labor and Industry form “Contractor’s or Subcontractor’s Weekly Payroll Certification for Public Works Projects” (forms LIPW-123 and LIPW-124).

E. There shall be paid each laborer or mechanic of the Contractor or Subcontractor engaged in the Work on this Project, in the trade or occupation listed on the attached Prevailing Minimum Wage Predetermination, not less than the hourly wage rate set opposite the same, regardless of any contractual relationship which may be alleged to exist between the Contractor, or any Subcontractor, and such laborers and mechanics.

F. These Contract provisions shall apply to all work performed on the Contract by the Contractor and to all work performed on the Contract by all subcontractors.

G. The Contractor shall insert in each of his subcontracts all of the stipulations contained in these required provisions.

H. No workmen may be employed on the Work except in accordance with the classifications set forth in the decision of the Secretary. In the event that additional or different classifications are necessary, the procedure set forth in the Regulations shall be followed.

I. All workmen employed or working on the Work shall be paid unconditionally, regardless of whether any contractual relationship exists or the contractual relationship which may be alleged to exist between any contractor, subcontractor, and workmen, not less than once a week without deductions or rebate, on any account, either directly or indirectly, except authorized deductions, the full amount due at the time of payment, computed at the rates applicable to the time worked in the appropriate classification. Nothing in this Contract, the Act or the Regulations shall prohibit the payment of more than the general prevailing minimum wage rates as determined by the Secretary to the workmen on the Work.

J. Each Prime Contractor or Subcontractor shall post the general prevailing minimum wage rates for each craft and classification involved, as determined by the Secretary of the Department of Labor and Industry, including the effective date of any changes thereof, in prominent and easily accessible places at the site of the work, or at such place or places as are used by them to pay the workmen their wages. The posted notice of wage rates must contain the following information:

1. Name of project.
2. Name of public body of which it is constructed.
3. The crafts and classifications of workmen listed in the Secretary's general prevailing minimum wage rate determination for the particular project.
4. The general prevailing minimum wage rates determined for each craft and classification and the effective date of any changes.
5. A statement advising workmen that if they have been paid less than the general prevailing minimum wage rate for their job classification or that the Contractor and/or subcontractor are not complying with the Act or the Regulations in any manner whatsoever, they may file a protest with the Secretary within three (3) months of the date of the occurrence, objecting to the payment to the Contractor to the extent of the amount or amounts due or to become due to them as wages for work performed on the Project. Any workmen paid less than the rate specified in the Contract shall have a civil right of action for the difference between the wage paid and wages stipulated in the Contract, which right of action must be exercised within six (6) months from the occurrence of the event creating such right.

K. The Contractor and all subcontractors shall keep an accurate record **showing the name, craft and/or classification, number of hours worked per day, and the actual hourly rate of wage paid (including employee benefits) to each**

workman employed by him in connection with the Work and such record must include any deductions from each workman. The record shall be preserved for two (2) years from the date of payment and shall open at all reasonable hours to the inspection of the Owner and to the Secretary or his duly authorized representative.

1. Apprentices shall be limited to such numbers as shall be in accordance with a bona fide apprenticeship program registered with and approved by the Pennsylvania Apprenticeship and Training Council and only apprentices whose training and employment are in full compliance with the provisions of the Apprenticeship and Training Act approved July 14, 1961 (Act No. 304) and the Rules and Regulation issued pursuant thereto shall be employed on the Work. Any workmen using the tools of a craft that does not qualify as an apprentice within the provisions of this submission shall be paid the rate predetermined for journeyman in that particular craft and/or classification.

L. Wages shall be paid without any deductions except authorized deductions. Employers not party to a contract requiring contributions for employee benefits which the Secretary has determined to be included in the general prevailing minimum wage rate shall pay the monetary equivalent thereof directly to the workman.

M. Payment of compensation to workmen for work performed on public work on a lump sum basis, or apiece work system, or a price certain for the completion of a certain amount of work, or the production of a certain result shall be deemed a violation of the Act and the Regulations, regardless of the average hourly earnings resulting therefrom.

N. Each Contractor and each subcontractor shall file a statement each week and a final statement at the conclusion of the Work on the Contract with Owner, under oath, and in form satisfactory to the Secretary, certifying that all workmen have been paid wages in strict conformity with the provisions of the Contract as prescribed by the Regulations, or if any wages remain unpaid, to the amount of wages due and owing to each workman respectively.

O. The provision of the Act and the Regulations are incorporated by reference in the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

A. Prevailing wage certification forms are to be produced weekly and are to be submitted monthly. Prevailing wage certificates are to be sent to Architect and CM with a pencil copy of the Application for Payment. No Applications for Payment will be processed without the proper prevailing wage certificates. Contractor may be requested to submit the prevailing wage certification forms in any of the following manners:

1. If hard paper copies are submitted, Contractor shall submit two (2) copies of each prevailing wage certification form.

2. If digital copies are submitted, Contractor shall submit to Architect and CM in PDF form.
3. Redacted certified payroll:

    a. Prevailing wage certification forms submitted to the Owner may not be redacted by law; however, if there is a Project Right-to-Know request, the Contractor will be required to submit redacted prevailing wage certification forms **in addition** to the required unredacted forms. The following information may be redacted:

        1) Employee Name
        2) Employee Address
        3) Employee Social Security Number

B. Contractor shall use the Commonwealth of Pennsylvania Department of Labor and Industry Form LLC-25 (form can be accessed at: http://www.dli.pa.gov/Individuals/Labor-Management-Relations/Documents/llc-25.pdf), as revised from time to time, and ensure proper classification of workmen are assigned to each person. Certificates must be filled out in their entirety. Form is included as Specification Section 007346.16. Certified Payroll submitted on U.S. Wage and Hour Division forms are NOT accepted and will be returned to the Contractor.

C. Regardless of the submission type, the first and the final certification forms must be notarized, signed, and dated.

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project Name:	Upper Providence Township Municipal Complex
General Description:	This project consists of interior and exterior renovations to an existing 5,560-square-foot township municipal office building, including an addition of a new front entry vestibule. This project also consists of interior renovations and conversion of an existing 4,250-square-foot District Court building into a Township Police Station. A new 1,700-square-foot addition is planned to provide new locker rooms for the police force. The addition will connect the main building to the existing 3,200-square-foot Maintenance Garage, which will be renovated, with a portion converted to a Police Processing Area and Holding Cells.
Project Locality	935 N Providence Rd, Media, PA
Awarding Agency:	Upper Providence Township
Contract Award Date:	12/17/2026
Serial Number:	26-09633
Project Classification:	Building
Determination Date:	11/5/2026
Assigned Field Office:	Philadelphia
Field Office Phone Number:	(215)560-1858
Toll Free Phone Number:	
Project County:	Delaware County

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-09633 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Asbestos & Insulation Workers	5/1/2026		$64.51	$50.26	$114.77
Boilermaker (Commercial, Institutional, and Minor Repair Work)	3/1/2026		$41.34	$19.23	$60.57
Boilermakers	1/1/2026		$58.00	$36.57	$94.57
Bricklayer	5/1/2025		$50.00	$32.57	$82.57
Bricklayer	5/1/2026		$51.15	$34.92	$86.07
Carpenter - Chief of Party (Surveying & Layout)	5/1/2026		$55.83	$30.39	$86.22
Carpenter - Chief of Party (Surveying & Layout)	5/1/2027		$58.03	$30.74	$88.77
Carpenter - Chief of Party (Surveying & Layout)	5/1/2028		$60.29	$31.09	$91.38
Carpenter - Chief of Party (Surveying & Layout)	5/1/2029		$62.63	$31.44	$94.07
Carpenter - Instrument Person (Surveying & Layout)	5/1/2026		$48.55	$30.39	$78.94
Carpenter - Instrument Person (Surveying & Layout)	5/1/2027		$50.46	$30.74	$81.20
Carpenter - Instrument Person (Surveying & Layout)	5/1/2028		$52.43	$31.09	$83.52
Carpenter - Instrument Person (Surveying & Layout)	5/1/2029		$54.46	$31.44	$85.90
Carpenter - Instrument Person (Surveying & Layout)	5/1/2030		$56.55	$31.79	$88.34
Carpenter - Rodman (Surveying & Layout)	5/1/2026		$24.28	$21.99	$46.27
Carpenter - Rodman (Surveying & Layout)	5/1/2027		$25.23	$22.34	$47.57
Carpenter - Rodman (Surveying & Layout)	5/1/2028		$26.22	$22.69	$48.91
Carpenter - Rodman (Surveying & Layout)	5/1/2029		$27.23	$23.04	$50.27
Carpenter - Rodman (Surveying & Layout)	5/1/2030		$28.28	$23.39	$51.67
Carpenters	5/1/2026		$48.55	$30.39	$78.94
Carpenters	5/1/2027		$50.46	$30.74	$81.20
Carpenters	5/1/2028		$52.43	$31.09	$83.52
Carpenters	5/1/2029		$54.46	$31.44	$85.90
Carpenters	5/1/2030		$56.55	$31.79	$88.34
Cement Finishers & Plasterers	5/1/2022		$38.57	$32.39	$70.96
Cement Masons	5/1/2025		$48.70	$32.46	$81.16
Dockbuilder, Pile Drivers	5/1/2026		$56.98	$37.99	$94.97
Dockbuilder/Pile Driver Diver	5/1/2026		$66.54	$41.74	$108.28
Dockbuilder/pile driver tender	5/1/2026		$56.98	$37.99	$94.97
Drywall Finisher	5/1/2025		$40.14	$32.35	$72.49
Electricians	6/1/2026		$55.25	$41.28	$96.53
Electricians	5/31/2027		$57.33	$42.80	$100.13
Electricians	5/29/2028		$59.49	$44.14	$103.63
Electricians	5/28/2029		$61.64	$45.49	$107.13
Elevator Constructor	1/1/2026		$74.86	$46.86	$121.72
Floor Coverer	5/1/2026		$52.84	$32.86	$85.70
Glazier	5/1/2026		$51.30	$39.37	$90.67
Interior Finish	5/1/2023		$34.60	$25.80	$60.40
Iron Workers (Bridge, Structural, Ornamental, Precast)	7/1/2024		$53.20	$45.01	$98.21
Iron Workers (Riggers)	7/1/2025		$44.77	$36.27	$81.04
Iron Workers (Riggers)	7/1/2026		$48.84	$36.52	$85.36
Iron Workers (Rodman/Reinforcing)	7/1/2025		$47.80	$36.65	$84.45
Iron Workers (Rodman/Reinforcing)	7/1/2026		$52.39	$36.90	$89.29
Laborers (Class 01 - See notes)	5/1/2025		$37.25	$26.10	$63.35

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-09633 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Laborers (Class 02 - See notes)	5/1/2025		$41.00	$27.70	$68.70
Laborers (Class 03 - See notes)	5/1/2025		$37.67	$26.28	$63.95
Laborers (Class 04 - See notes)	5/1/2025		$37.67	$26.28	$63.95
Laborers (Class 05 - See notes)	5/1/2025		$37.25	$26.10	$63.35
Landscape Laborer	5/1/2025		$32.15	$24.30	$56.45
Marble Finisher	5/1/2026		$42.07	$31.85	$73.92
Marble Mason	5/1/2023		$47.20	$31.95	$79.15
Marble Setter	5/1/2026		$51.50	$33.80	$85.30
Mason Tender, Cement	5/1/2023		$35.02	$25.98	$61.00
Millwright	5/1/2026		$60.20	$35.81	$96.01
Operators (Building, Class 01 - See Notes)	5/1/2025		$54.52	$34.49	$89.01
Operators (Building, Class 01 - See Notes)	5/1/2026		$55.67	$35.34	$91.01
Operators (Building, Class 01A - See Notes)	5/1/2025		$57.52	$35.38	$92.90
Operators (Building, Class 01A - See Notes)	5/1/2026		$58.68	$36.22	$94.90
Operators (Building, Class 02 - See Notes)	5/1/2025		$54.27	$34.42	$88.69
Operators (Building, Class 02 - See Notes)	5/1/2026		$55.43	$35.26	$90.69
Operators (Building, Class 02A - See Notes)	5/1/2025		$57.29	$35.29	$92.58
Operators (Building, Class 02A - See Notes)	5/1/2026		$58.44	$36.14	$94.58
Operators (Building, Class 03 - See Notes)	5/1/2025		$50.18	$33.22	$83.40
Operators (Building, Class 03 - See Notes)	5/1/2026		$51.34	$34.06	$85.40
Operators (Building, Class 04 - See Notes)	5/1/2025		$49.88	$33.13	$83.01
Operators (Building, Class 04 - See Notes)	5/1/2026		$51.04	$33.97	$85.01
Operators (Building, Class 05 - See Notes)	5/1/2025		$48.16	$32.62	$80.78
Operators (Building, Class 05 - See Notes)	5/1/2026		$49.32	$33.46	$82.78
Operators (Building, Class 06 - See Notes)	5/1/2025		$47.17	$32.33	$79.50
Operators (Building, Class 06 - See Notes)	5/1/2026		$48.34	$33.16	$81.50
Operators (Building, Class 07A- See Notes)	5/1/2025		$66.26	$39.55	$105.81
Operators (Building, Class 07A- See Notes)	5/1/2026		$67.73	$40.48	$108.21
Operators (Building, Class 07B- See Notes)	5/1/2025		$65.97	$39.46	$105.43
Operators (Building, Class 07B- See Notes)	5/1/2026		$67.44	$40.39	$107.83
Painters Class 1 (see notes)	5/1/2026		$45.71	$35.22	$80.93
Painters - Line Stripping	12/1/2025		$45.12	$29.41	$74.53
Painters Class 4 (see notes)	5/1/2026		$48.45	$35.22	$83.67
Plasterers	5/1/2024		$39.88	$33.08	$72.96
plumber	5/1/2025		$70.53	$39.46	$109.99
plumber	5/1/2026		$73.73	$40.36	$114.09
Pointers, Caulkers, Cleaners	5/1/2025		$51.35	$31.80	$83.15
Pointers, Caulkers, Cleaners	5/1/2026		$53.35	$32.30	$85.65
Roofers (Composition)	5/1/2024		$44.13	$34.77	$78.90
Roofers (Composition)	5/1/2026		$47.53	$35.22	$82.75
Roofers (Shingle)	5/1/2024		$34.35	$22.20	$56.55
Roofers (Slate & Tile)	5/1/2024		$37.35	$22.20	$59.55
Sheet Metal Workers	5/1/2025		$62.62	$52.17	$114.79
Sheet Metal Workers	5/1/2026		$65.06	$54.48	$119.54

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-09633 - Building	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Sign Makers and Hangars	7/15/2025		$33.48	$26.41	$59.89
Sign Makers and Hangars	7/15/2026		$36.38	$25.01	$61.39
Sprinklerfitters	1/1/2023		$62.23	$31.99	$94.22
Sprinklerfitters	5/1/2025		$70.37	$34.85	$105.22
Steamfitters	5/1/2024		$70.32	$43.09	$113.41
Steamfitters	5/1/2025		$72.52	$44.89	$117.41
Stone Masons	5/1/2025		$50.00	$32.80	$82.80
Stone Masons	5/1/2026		$51.50	$33.80	$85.30
Terrazzo Finisher	5/1/2025		$45.61	$29.41	$75.02
Terrazzo Finisher	5/1/2026		$47.78	$29.61	$77.39
Terrazzo Grinder	5/1/2025		$45.88	$29.41	$75.29
Terrazzo Grinder	5/1/2026		$47.78	$29.61	$77.39
Terrazzo Mechanics	5/1/2025		$52.21	$31.26	$83.47
Terrazzo Mechanics	5/1/2026		$53.36	$32.61	$85.97
Tile Finisher	5/1/2025		$41.17	$30.75	$71.92
Tile Finisher	5/1/2026		$42.07	$31.85	$73.92
Tile Setter	5/1/2025		$52.21	$31.26	$83.47
Tile Setter	5/1/2026		$53.36	$32.61	$85.97
Truckdriver class 1(see notes)	5/1/2026		$38.57	$23.87	$62.44
Truckdriver class 2 (see notes)	5/1/2026		$38.67	$23.87	$62.54
Truckdriver class 3 (see notes)	5/1/2026		$38.92	$23.87	$62.79
Window Film / Tint Installer	6/1/2025		$27.42	$15.13	$42.55
Window Film / Tint Installer	6/1/2026		$28.35	$15.60	$43.95

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-09633 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Bricklayer	5/1/2026		$51.15	$34.92	$86.07
Carpenter - Chief of Party (Surveying & Layout)	5/1/2025		$65.96	$30.09	$96.05
Carpenter - Chief of Party (Surveying & Layout)	5/1/2026		$67.52	$30.44	$97.96
Carpenter - Instrument Person (Surveying & Layout)	5/1/2025		$58.39	$29.06	$87.45
Carpenter - Instrument Person (Surveying & Layout)	5/1/2026		$60.09	$29.06	$89.15
Carpenter - Rodman (Surveying & Layout)	5/1/2025		$45.88	$23.19	$69.07
Carpenter - Rodman (Surveying & Layout)	5/1/2026		$46.97	$23.54	$70.51
Carpenter	5/1/2026		$58.71	$30.44	$89.15
Cement Masons	5/1/2025		$46.55	$32.66	$79.21
Dockbuilder, Pile Drivers	5/1/2026		$56.98	$37.99	$94.97
Dockbuilder/Pile Driver Diver	5/1/2026		$61.88	$45.47	$107.35
Dockbuilder/pile driver tender	5/1/2026		$56.98	$37.99	$94.97
Electric Lineman	6/3/2024		$62.07	$33.96	$96.03
Electric Lineman	6/2/2025		$65.10	$34.45	$99.55
Iron Workers (Bridge, Structural, Ornamental, Precast)	7/1/2024		$53.20	$45.01	$98.21
Iron Workers (Riggers)	7/1/2023		$42.53	$34.14	$76.67
Iron Workers (Rodman/Reinforcing)	7/1/2023		$45.70	$34.77	$80.47
Laborers (Class 01 - See notes)	5/1/2025		$40.20	$27.80	$68.00
Laborers (Class 01 - See notes)	5/1/2026		$41.65	$27.90	$69.55
Laborers (Class 02 - See notes)	5/1/2025		$40.40	$27.80	$68.20
Laborers (Class 02 - See notes)	5/1/2026		$41.85	$27.90	$69.75
Laborers (Class 03 - See notes)	5/1/2025		$40.40	$27.80	$68.20
Laborers (Class 03 - See notes)	5/1/2026		$41.85	$27.90	$69.75
Laborers (Class 04 - See notes)	5/1/2025		$35.00	$27.80	$62.80
Laborers (Class 04 - See notes)	5/1/2026		$36.45	$27.90	$64.35
Laborers (Class 05 - See notes)	5/1/2025		$41.05	$27.80	$68.85
Laborers (Class 05 - See notes)	5/1/2026		$42.50	$27.90	$70.40
Laborers (Class 06 - See notes)	5/1/2025		$41.10	$27.80	$68.90
Laborers (Class 06 - See notes)	5/1/2026		$42.55	$27.90	$70.45
Laborers (Class 07 - See notes)	5/1/2025		$40.95	$27.80	$68.75
Laborers (Class 07 - See notes)	5/1/2026		$42.40	$27.90	$70.30
Laborers (Class 08 - See notes)	5/1/2025		$40.70	$27.80	$68.50
Laborers (Class 08 - See notes)	5/1/2026		$42.15	$27.90	$70.05
Laborers (Class 09 - See notes)	5/1/2025		$40.55	$27.80	$68.35
Laborers (Class 09 - See notes)	5/1/2026		$42.00	$27.90	$69.90
Laborers (Class 10- See notes)	5/1/2025		$40.70	$27.80	$68.50
Laborers (Class 10- See notes)	5/1/2026		$42.15	$27.90	$70.05
Laborers (Class 11 -See Notes)	5/1/2025		$40.60	$27.80	$68.40
Laborers (Class 11 -See Notes)	5/1/2026		$42.05	$27.90	$69.95
Laborers (Class 12 -See Notes)	5/1/2025		$42.30	$27.80	$70.10
Laborers (Class 12 -See Notes)	5/1/2026		$42.85	$27.90	$70.75
Laborers (Class 13 -See Notes)	5/1/2025		$44.33	$27.80	$72.13
Laborers (Class 13 -See Notes)	5/1/2026		$45.78	$27.90	$73.68
Laborers (Class 14 -See Notes)	5/1/2025		$40.90	$27.80	$68.70

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-09633 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Laborers (Class 14 -See Notes)	5/1/2026		$41.90	$27.90	$69.80
Laborers Utility (PGW ONLY) (Flagperson)	5/1/2026		$35.52	$19.83	$55.35
Laborers Utility (PGW ONLY)	5/1/2026		$42.55	$19.83	$62.38
Landscape Laborer	5/1/2025		$31.73	$24.15	$55.88
Millwright	5/1/2026		$60.20	$35.81	$96.01
Operators Class 01 - See Notes (Building, Heavy, Highway)	5/1/2025		$54.52	$34.49	$89.01
Operators Class 01 - See Notes (Building, Heavy, Highway)	5/1/2026		$55.67	$35.34	$91.01
Operators Class 01a - See Notes (Building, Heavy, Highway)	5/1/2025		$57.52	$35.38	$92.90
Operators Class 01a - See Notes (Building, Heavy, Highway)	5/1/2026		$58.68	$36.22	$94.90
Operators Class 02 - See Notes (Building, Heavy, Highway)	5/1/2025		$54.27	$34.42	$88.69
Operators Class 02 - See Notes (Building, Heavy, Highway)	5/1/2026		$55.43	$35.26	$90.69
Operators Class 02a - See Notes (Building, Heavy, Highway)	5/1/2025		$57.29	$35.29	$92.58
Operators Class 02a - See Notes (Building, Heavy, Highway)	5/1/2026		$58.44	$36.14	$94.58
Operators Class 03 - See Notes (Building, Heavy, Highway)	5/1/2025		$50.18	$33.22	$83.40
Operators Class 03 - See Notes (Building, Heavy, Highway)	5/1/2026		$51.34	$34.06	$85.40
Operators Class 04 - See Notes (Building, Heavy, Highway)	5/1/2025		$49.88	$33.13	$83.01
Operators Class 04 - See Notes (Building, Heavy, Highway)	5/1/2026		$51.04	$33.97	$85.01
Operators Class 05 - See Notes (Building, Heavy, Highway)	5/1/2025		$48.16	$32.62	$80.78
Operators Class 05 - See Notes (Building, Heavy, Highway)	5/1/2026		$49.32	$33.46	$82.78
Operators Class 06 - See Notes (Building, Heavy, Highway)	5/1/2025		$47.17	$32.33	$79.50
Operators Class 06 - See Notes (Building, Heavy, Highway)	5/1/2026		$48.34	$33.16	$81.50
Operators Class 07 (A) - See Notes (Building, Heavy, Highway)	5/1/2025		$66.26	$39.55	$105.81
Operators Class 07 (A) - See Notes (Building, Heavy, Highway)	5/1/2026		$67.73	$40.48	$108.21
Operators Class 07 (B) - See Notes (Building, Heavy, Highway)	5/1/2025		$65.97	$39.46	$105.43
Operators Class 07 (B) - See Notes (Building, Heavy, Highway)	5/1/2026		$67.44	$40.39	$107.83
Painters - Line Stripping	12/1/2025		$45.12	$29.41	$74.53
Painters Class 2 (see notes)	2/1/2026		$51.61	$35.00	$86.61
Painters Class 3 (see notes)	2/1/2026		$62.57	$35.04	$97.61
Pointers, Caulkers, Cleaners	5/1/2025		$51.35	$31.80	$83.15
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2025		$68.89	$44.73	$113.62
Truckdriver class 1(see notes)	5/1/2026		$38.42	$23.87	$62.29

BUREAU OF LABOR LAW COMPLIANCE
PREVAILING WAGES PROJECT RATES

Project: 26-09633 - Heavy/Highway	Effective Date	Expiration Date	Hourly Rate	Fringe Benefits	Total
Truckdriver class 2 (see notes)	5/1/2024		$36.74	$22.54	$59.28
Truckdriver class 2 (see notes)	5/1/2026		$38.52	$23.87	$62.39
Truckdriver class 3 (see notes)	5/1/2026		$38.77	$23.87	$62.64

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AIA® Document G732® – 2019

Application and Certificate for Payment, Construction Manager as Adviser Edition

TO OWNER:

PROJECT:

APPLICATION NO:

DISTRIBUTION TO:

OWNER ☐
CONSTRUCTION MANAGER ☐
ARCHITECT ☐
CONTRACTOR ☐
FIELD ☐
OTHER ☐

PERIOD TO:

FROM CONTRACTOR:

VIA CONSTRUCTION MANAGER:

CONTRACT DATE:

PROJECT NOS: / /

CONTRACT FOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703™, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM ..... $

2. NET CHANGES IN THE WORK ..... $

3. CONTRACT SUM TO DATE *(Line 1 ± 2)* ..... $

4. TOTAL COMPLETED AND STORED TO DATE *(Column G on G703)* ..... $

5. RETAINAGE:

a. _____ % of Completed Work
(Column D + E on G703) $

b. _____ % of Stored Material
(Column F on G703) $

Total Retainage *(Lines 5a + 5b, or Total in Column I on G703)* ..... $

6. TOTAL EARNED LESS RETAINAGE ..... $
(Line 4 minus Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT .....
(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE ..... $

9. BALANCE TO FINISH, INCLUDING RETAINAGE
(Line 3 minus Line 6) $

SUMMARY OF CHANGES IN THE WORK	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this month, including Construction Change Directives	$	$
TOTALS	$	$
NET CHANGES IN THE WORK	$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:
County of:
Subscribed and sworn to before me this day of
Notary Public:
My Commission expires: _____

CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on evaluations of the Work and the data comprising this application, the Construction Manager and Architect certify to the Owner that to the best of their knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

CONSTRUCTION MANAGER:

By: _____ Date: _____

ARCHITECT: *(NOTE: If multiple contractors are responsible for performating portions of the Project, the Architect's Certification is not required.)*

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

Sample

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AIA® Document G703® – 1992

Continuation Sheet

AIA Document G702®, Application and Certificate for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached. Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED *(Not in D or E)*	TOTAL COMPLETED AND STORED TO DATE *(D+E+F)*	% *(G ÷ C)*	BALANCE TO FINISH *(C – G)*	RETAINAGE *(If variable rate)*
			FROM PREVIOUS APPLICATION *(D + E)*	THIS PERIOD					
	GRAND TOTAL								

Sample

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SECTION 00 7500 - WAIVER OF CLAIMS AFFIDAVIT

This document is to accompany ALL Applications for Payment.

Date:

From:

Re: Application No. _____

Project Name: _____

Intending to be legally bound hereby, we certify that _____ (Contractor) waives any and all claims for additional cost and/or time arising out of, or relating to, any of the work performed as of the date of the above-referenced Application, other than those claims for which has already provided Contractor notice in writing in accordance with the requirements of the Contract Documents.

By: _____

Title: _____

Date: _____

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SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed under Owner’s separate contracts.
4. Work sequence.
5. Contractor’s use of site and premises.
6. Coordination with occupants
7. Work restrictions.
8. Specification and Drawing conventions.
9. Miscellaneous provisions

B. Related Requirements:

1. Section 011400 “Work Restrictions” for limitations governing the use of Project Site.

2. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

3. Section 017300 “Execution” for coordination of Owner-installed products.

1.3 PROJECT INFORMATION

A. Project Identification: Upper Providence Twp Municipal Complex Renovations

B. Project Location: 935 N Providence Rd, Media, PA 19063

C. Owner: Upper Providence Township

D. Owners Representative Identification: The Construction Manager (CM) for the project is New Road Construction Managment. 95 W Court St, Doylestown PA 18901.

1. Nick Saunders, Sr. Project Manager

   Mobile: 215-933-9951

   Email: nsaunders@newroadcm.com

E. Architect: MKSD, LLC; 1209 Hausman Road, Suite A, Allentown, PA 18104.

F. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Consultant – Barry Isett & Associates, 5420 Crackersport Rd, Allentown, PA 18104

2. Mechanical, Plumbing & Electrical Consultant: HB Engineers Inc., 2900 Hamilton Blvd, Suite 200, Allentown, PA 18103

G. Owner's Consultant: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Civil Consultant – Kelly Engineers & Surveyors, 30 LaCrue Ave, Suite 201, Glen Mills, PA 19342

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Site clearing and staging area preparation
2. New building construction and associated site work
3. Renovations to portions of the existing buildings
4. Staged Construction

B. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011250 "Multiple Contract Summary" for a list of multiple contracts, a description of work included under each of the multiple contracts, and the responsibilities of Project coordinator.

1. General (GC, Includes Civil / Site work)
2. Plumbing (PC, Includes Fire Protection scope)
3. Mechanical (HC / MC / HVAC)
4. Electrical (EC, Includes Security, A/V, I/T scope)

C. Testing:

1. Contractors are to perform all factory or shop testing, and any other testing required.
2. Contractors are to perform any field testing of electrical systems or data wiring systems.
3. Contractors are to perform testing of above or below ground pipes, ductwork, and mechanical systems including pressure, air, water, or vacuum testing required.

4. All contractor testing shall be performed in the presence of the Construction Manager and/or (if required) in the presence of the municipal agency having jurisdiction.

D. Construction Waste Management for all Project activities is by each Prime Contractor. Construction Waste Management for any demolition work and any site features is by the Contractor performing the work.

E. The Contractor responsible for installation of the systems and equipment is responsible for commissioning each system. The minimum commissioning requirements in accordance with Section 019113 and other specific project requirements, including coordination and verification, shall be the responsibility of the Contractor.

F.

1. Contract Documents, dated November 10, 2026, were prepared for the Project by MKSD, LLC., 1209 Hausman Road, Suite A, Allentown, PA 18104.

1.5 WORK PERFORMED UNDER OWNER'S SEPARATE CONTRACTS

A. Cooperate fully with Owner and separate Owner-hired firms and/or agencies so work may be carried out smoothly, without interfering with or delaying Work under this Contract. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

1. Construction testing and special inspections will be by separate firm hired by the Owner. The Owner will procure and bear costs for **only the following:** field testing for earthwork, concrete, masonry, asphalt and concrete paving, fireproofing, and structural steel.
2. Commissioning Verification Authority and HVAC testing, adjusting, and balancing (CVA/TAB) will be by separate firm hired by the Owner and will require the participation and cooperation of all contractors. The Mechanical Contractor is responsible for all pressure testing of any pipes, ductwork, or field systems and for coordinating and supporting all the testing and balancing.
3. Indoor Air Quality Testing is by Owner's independent testing agency.
4. Other contracts are at the Owner's sole discretion.

1.6 WORK SEQUENCE

A. The entire Work shall be completed in compliance with the Project phasing indicated on the Drawing Staging and Logistic Plan(s), and the milestone completion dates listed. Any deviations from these requirements shall be subject to the approval of the Construction Manager. The Owner reserves the right to enforce liquidated damages for contractor's non-compliance with any of the phasing, milestone, and substantial completion dates.

1. The Notice to Proceed for Procurement and Administration-only, will be issued within one month of Bid Opening.

2. The Notice to Proceed for on-site construction, is expected to be issued on April 1, 2027.
3. Completion for each phase and milestones are noted on the Staging Plan and must be strictly complied with.
4. Completion for all contracts is as follows:

    a. Project Substantial Completion – 2/15/28
    b. Project Final Completion – 3/15/28

B. See Staging Plan(s) for milestone dates. The contractors' sequence and CPM schedule shall incorporate all milestone dates and comply with all dates noted therein for completing the Project. The dates provided are the milestone completion dates which will be enforced. All building systems are to be installed in compliance with the milestone dates identified on the Phasing Plans.

C. Contractors shall reference Section 014000, "Work Restrictions" and the Staging and Logistic Drawings for special requirements.

D. Construction work for the building shall be performed in a sequence to ensure that all building systems are systematically installed in an efficient manner. The mechanical and electrical rooms shall be constructed in an early sequence to permit rough-in by the Mechanical, Electrical, and Plumbing trades and to ensure proper operation of life safety systems in occupied areas of the building in the timeframes identified on the Staging and Logistic Plans.

E. Contractor is to clean and turn over the building in a sequence for Owner fit-out needs but not occupancy, at least one month prior to the substantial completion date or as stated on the Staging and Logistic Plans.

F. If the Notice to Proceed is delayed for any reason beyond the control of any Prime Contractor that prevents the Contractor from performing Work, all phased completion dates and milestone completion dates will be adjusted by the exact same number of days with no cost implications to the Owner.

G. If a specific milestone or phased completion date is delayed for any reason beyond the control of any Prime Contractor that prevents the Contractor from performing Work, and the delay impacts subsequent milestone and phased completion dates, remaining milestone and phased completion dates will be adjusted by the exact same number of days with no cost implications to the Owner.

H. Liquidated damages apply for all phased completion dates and milestone completion dates shown on the Staging and Logistic Drawings.

I. All Work must be completed in accordance with the Staging Drawings, the Project, the approved Project schedule, and in a sequence approved by the Construction Manager, Architect, and Owner.

J. The Staging Plans identify timeframes necessary for the Owner to complete moving operations for occupancy of individual building areas. In the event of any delay in the Work that will impact the relocation or moving of Owner's operations, furnishings, or equipment, the Owner has the discretion to adjust its move or relocation milestone

schedule by up to 30 days. Such action by the Owner shall be issued in writing to the contractor not less than 30 days prior to the anticipated milestone date.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. General: Contractor shall have limited use of Project site for construction operations as designated on the Staging Plan(s) during construction period. The site is surrounded by business uses and public streets. The site will remain occupied during construction. The Contractor must coordinate activities and cooperate with adjacent uses. Contractor must also schedule, coordinate, and perform construction activities to avoid disruption of ongoing operations. Contractor must schedule and perform certain work on weekends and holidays to avoid disruptions. This may include street and utility work.

B. Contractors shall place trailers and materials in designated areas as indicated on Staging Plan(s) and in coordination with Construction Manager.

C. Burial of waste materials is not permitted.

1.8 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Staff will occupy existing portions of the buildings during construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate usage. Perform the Work so as not to interfere with Owner's day-to-day operations.

B. Maintain access to existing walkways and other adjacent occupied or used site facilities. Do not close or obstruct walkways, driveways, or other occupied or used areas without written permission from Owner and approval of authorities having jurisdiction.

1. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Technical Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.

1.10 MISCELLANEOUS PROVISIONS

A. Prior to acceptance as substantially complete, all general construction, all mechanical, electrical, and plumbing systems shall be complete, fully operational, tested as required, inspected by approval authorities, and certified complete.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours as determined by Owner.

C. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 Contractor shall complete all work in the time period specified in the Contract. Contractor(s) shall include all necessary time, and the related cost required including but not limited to; overtime, shift work, weekends, and holidays in order to complete the work as specified within the Contract time.

END OF SECTION 01 1000

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SECTION 01 12 50 – MULTIPLE CONTRACT SUMMARY

A. General

A.1. Related Documents – Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

A.2. Summary

A.2.1. Section includes a summary of each Prime Contract, including responsibilities for coordination and temporary facilities and controls.

A.2.2. Specific requirements for Work of each Prime Contract are also indicated in individual Specification Sections and on Drawings.

A.2.3. Related Requirements

A. Division 00 Section 00 8200 “Safety and Health Management Plan Project Requirements” for responsibilities of individual Prime Contractors’
B. Division 01 Section 01 1100 "Summary of the Project" for the Work covered by Contract Documents and for work sequence.
C. Division 01 Section 01 1400 "Work Restrictions" for use of the Project site and for requirements for continued Owner occupancy of premises.
D. Division 01 Section 01 3100 "Project Management and Coordination" for general coordination requirements.
E. Division 01 Section 01 5000 "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.
F. Division 01 Section 01 1500 “Field Engineering” for specific requirements of field engineering services.
G. Division 01 Section 01 9113 “General Commissioning Requirements” for additional information and procedures.

1.3 DEFINITIONS

1.3.1 Permanent Enclosure: As determined by Architect and/or Construction Manager, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial (watertight and insulated) temporary closures.

1. Coordinate: The term “coordinate” means “to cooperate with related trades to furnish and install all connections between the trades in correct sequence size and location to create a complete system ready for intended use.”

2. Verify: The term “verify” means “to measure, investigate, review, test, check the accuracy or correctness of, and prove by demonstration, evidence, or testimony the location, size, dimension, and condition of an item.”

3. Furnish: The term “furnish” is used to mean “supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.”

4. Install: The term “install” is used to describe operations at the project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, performing, coordinating with other trades, protecting, cleaning, and similar activities.”

5. Provide: The term “provide” means “to furnish and install, complete, and ready for the intended use.”

A.3. Coordination

A.3.1. Project Coordinator shall be responsible for coordination between the General Construction Contract, Mechanical Contract, Plumbing Contract, Fire Protection Contract, and Electrical Contract.

A. The General Construction Contractor (GC) shall act as and assume responsibilities of Project Coordinator or Lead Contractor which are designated throughout the Contract Documents. The General Contractor shall be the full-time Project Coordinator and shall be experienced in Administration and Supervision of building construction activities, including Civil, Mechanical, Electrical, Plumbing and Fire Protection work.

B. HVAC, Plumbing, and Electrical Coordinators, who shall be subordinate to Project Coordinator, shall be responsible for coordination between the Plumbing Contract, HVAC Contract, and Electrical Contract.

C. The HVAC Contractor shall be responsible for the assembly of coordination drawings for himself, and the inclusion of coordination drawings provided by the Electrical, and Plumbing Contractors.

D. The HVAC (Mechanical) Contractor shall be the primary M/E/P/FP coordinator and shall be responsible for the preparation of AutoCAD electronic coordination drawings between HVAC, plumbing, fire protection, and electrical trades. The Plumbing, Fire Protection, and Electrical Contractors shall provide such information electronically to fully coordinate their work with that of the other primes and in the format requested by the HVAC Contractor. All Prime Contractors shall cooperate and be responsible for preparation and compliance with coordination drawings.

E. GC shall coordinate all work in accordance with project phasing requirements and scheduled activities of all other contractors. GC shall perform cutting and patching of all roofing materials including metal deck. Any structural reinforcement required is by the General Contractor.

F. The MC, PC, and EC shall be responsible for providing and maintaining water-tight conditions for all exterior wall and roof penetrations / openings that are part of their scope.

5. Project Coordinator Responsibilities

1. Project Coordinator: Full-time Project Coordinator shall be experienced in administration and supervision of building construction, including Civil, HVAC, plumbing, fire protection, and electrical work.

A.5.2. Project Coordinator shall perform Project Coordination activities for the multiple contracts, including, but not limited to, the following:

A. Provide typical overall coordination of the Work.
B. Provide overall coordination to project phasing.
C. Coordinate shared access to workspaces.
D. Coordinate product selections for compatibility.
E. Provide overall coordination of temporary facilities and controls.
F. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
G. Coordinate construction and operations of the Work with work performed by each Contract and Owners subcontractors.
H. Coordination Drawings:
    1. Prepare overall coordination drawings in collaboration with each contractor to coordinate work by more than one contract. MC to prepare coordination drawings between MEP contractors.
    2. Provide drawings and information and cooperate with other Contractors during preparation of Coordination Drawings.
    3. Oversee and review preparation of Coordination Drawings to ensure contract requirements are met and properly sequenced.
    4. Implement the requirements of the Coordination Drawings.
I. Coordinate sequencing and scheduling of the Work. Include the following:
    1. Initial Coordination Meeting – At earliest possible date, arrange and conduct a meeting with contractors and Construction Manager for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.
    2. Prepare combined Contractors' Construction Schedule for entire Project. Base schedule on preliminary construction milestone schedule and phasing plan included in contract documents. Secure time commitments for performing critical construction activities from contractors. Show activities of each contract on a separate sheet. Prepare a simplified summary sheet indicating combined construction activities of contracts.
        a. Submit schedules to Construction Manager for approval.
        b. Prepare recovery schedules as needed.
        c. Distribute copies of approved schedules to separate Contractors, Construction Manager, Architect, and Owner.
J. Provide photographic and video documentation of existing conditions, work as it progresses and at the completion.
K. Provide quality-assurance and quality-control services specified in Section 014000 "Quality Requirements."
L. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections, including all code department required inspections.
M. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
N. Locate existing permanent benchmarks, control points, and similar reference points, and establish permanent benchmarks on Project site.
O. Provide field surveys of in-progress construction and site work and, if required, final property survey.
P. Provide daily progress cleaning of common areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
Q. Coordinate cutting and patching.

R. Coordinate protection of the Work.
S. Coordinate fire-stopping.
T. Coordinate completion of interrelated punch list items.
U. Coordinate progress and final cleaning.
V. Provide final cleaning of areas of Work.
W. Construction Manager will coordinate preparation of Project Record Documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
X. Print and submit Record Documents if installations by more than one contractor are indicated on the same Contract Drawing or Shop Drawing.
Y. Construction Manager will collect record Specification Sections from contractors, collate Sections into numeric order, and submit complete set.
Z. Construction Manager will coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
AA. Before the concrete floor slab is poured, create a rough-in drawing indicating locations of under slab and in-wall conduits and utilities related to Work by Owner's Vendors. Intent: Vendors' Work requires coordination with Prime Contractors' Work.
BB. Coordinate work of all Owner vendors.

6. MEP&FP Coordinator Responsibilities (Falls under Mechanical Construction Contract)

A.6.1. Mechanical, Electrical, Plumbing, and Fire Protection (MEP&FP) Coordinator – Full-time HVAC, Plumbing, and Electrical Coordinators shall be experienced in coordination of M/E/P/FP construction. Coordination activities of (MEP&FP) coordinator include, but are not limited to, the following
A. Schedule and sequence mechanical, electrical, plumbing, and fire protection activities.
B. Coordinate sharing access to workspaces by mechanical, electrical, plumbing and fire protection contractors.
C. Coordinate integration of mechanical, electrical, plumbing and fire protection work into limited spaces.
D. Coordinate protection of mechanical, electrical, plumbing and fire protection contractors' work.
E. Coordinate cutting and patching for mechanical, electrical, plumbing and fire protection work.
F. Take the lead and be responsible for mechanical, electrical, plumbing and fire protection coordination drawings. Coordination drawings must be reviewed with Project Coordinator for finish ceiling heights. Drawings shall coordinate and include but not be limited to the following components:
1. Structural System limits.
2. Ceiling heights.
3. Electrical systems.
4. Fire protection systems
5. Mechanical piping & ductwork.
6. Storm and sanitary piping.
7. Data and telecommunications.
G. Coordinate tests and inspections for mechanical, electrical, plumbing and fire protection work
H. Coordinate mechanical, electrical, plumbing and fire protection temporary services and facilities.

I. Coordinate with all utility companies with bringing all utilities into the site (i.e. electric, cable, water, sewer, etc.)

7. General Parameters for Mechanical, Electrical, Plumbing, and Fire Protection Coordination Drawings

A.7.1. HVAC contractor is responsible for integrating coordination drawings.

A.7.2. Coordination drawings must be prepared electronically and in ACAD format.

A.7.3. Comply with the requirements for coordination drawings as specified in the Division 01 Section “Project Management and Coordination.”

A.7.4. HVAC contractor shall within 20 days of a fully executed contract distribute layout drawings in CAD format to all Contractors. Layout drawings shall include but not be limited to the following:
A. Columns and beams.
B. Ceiling heights.
C. Ceiling dimensional layouts per the reflected ceiling plans
D. Ceiling grid
E. Coordination drawings of ceiling cavities and mechanical rooms demonstrating the spatial relationship and necessary clearances within the available space above ceilings and within rooms for HVAC, plumbing, fire protection, electrical and structural systems.
F. Wall to wall dimensions
G. Partition layouts
H. Windows, doors, and other openings
I. Heights from ceiling to structural components
J. Dimensions from column centerlines
K. Other appropriate building features.

A.7.5. Upon receipt of layout CAD files, each contractor shall proceed immediately and independently to indicate their work as overlays on the CAD files. This work shall be done within the next 4 days unless otherwise agreed upon by the Construction Manager.

A.7.6. The drawing layout prepared by each contractor shall be transmitted to HVAC contractor and other contractors for comment and adjustments.

A.7.7. Coordination meetings will be held, and all contractors will be required to attend and cooperate. Changes shall be made as requested by HVAC contractor. This process shall take up to 30 days.

A.7.8. Contractors shall also prepare additional CAD drawings as necessary to adequately and completely show the intended routing and layout of their work. Additional drawings may include riser diagrams, flow sheets, elevations, details, sections, isometric layouts, etc. as determined by the HVAC contractor and the Architect.

A.7.9. The Prime Contractor responsible for Work in each of the following categories shall prepare or arrange for preparation of Coordination Drawings for the following systems:
A. HVAC systems
B. Plumbing systems
C. Fire protection systems including sprinklers if required by the contract documents.

D. Electrical systems
E. Openings and sleeves in structural slabs
F. Ceiling systems.

A.7.10. Include on Coordination Drawings the information listed below for each of the following categories of Work:

A. Mechanical Systems:
1. Sizes and bottom/headroom elevations of new electric unit heaters.
2. Weights of each unit and the proposed attachment structure.
3. Locations of major components, including dampers, valves, diffusers, cleanouts, and electrical distribution equipment.

B. Electrical Systems:
1. Horizontal and vertical runs of conduit 1-1/4 inch diameter and larger
2. Light fixture locations and mounting type.
3. Smoke and Carbon Monoxide detector locations.
4. Panel boards, switch boards, switch gear, transformers, busways, generator, and motor control center.
5. Exit signs, strobe/horn, and emergency battery pack locations
6. Pull box dimensioned from column centerlines.

C. Fire Protection Systems:
1. Sizes and centerline elevations of sprinkler piping.
2. Sprinkler head locations with elevations referenced to ceiling heights .
3. Locations of major valves.

D. Structural Work:
1. Openings and sleeve locations required in slabs, walls, beams, and other structural elements, including required openings not indicated on Contract Documents.
2. Slab edge locations.

E. Elevated floor and roof Structure, Reflected Ceiling:
1. Locations and attachment methods of mechanical, fire protection and electrical items, including grilles, registers, diffusers, light fixtures, smoke detectors, sprinkler heads, exit signs, speakers, and other items.
2. Conform to locations indicated on Contract Drawings to the minimum extent possible.
3. Indicate positions relative to acoustical ceiling grid where applicable.

A.7.11. HVAC contractor shall put together all information for final preparation and submission of integrated coordination drawings. This shall be done within 60 days of a fully executed contract for all areas of the building unless otherwise approved by Owner.

A.7.12. Any Contractor not complying with any of the coordination requirements including the timelines will be assessed $600.00 for each day that Contractor is not in compliance.

8. General Requirements of Contracts

A.8.1. Extent of Contract – Unless the Agreement contains a more specific description of the Work of each Contract, requirements indicated on Drawings and in Specification Sections determine which contract includes a specific element of Project.

A. Unless otherwise indicated, the work described in this Section for each contract shall be complete systems and assemblies, including products,

components, accessories, and installation required by the Contract Documents.

B. Local custom and trade-union jurisdictional settlements do not control the scope of the Work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruption and delays.
C. Trenches, other excavation and backfill outside the Building, for the work of each contract shall be by the contractor performing the work. GC shall be responsible for all concrete pads for all work including pads for all other primes. GC is also responsible for all bollards in the sallyport.
D. Trenches are not to be left open unless they are enclosed by fencing or barriers.
E. Blocking, backing panels, sleeves, and metal fabrication supports for the work of each contract shall be the work of each contract for its own work.
F. Furnishing of access panels for the work of each contract shall be the work of each contract for its own work. Installation and finishing of access panels shall be the work of the General Contractor.
G. Work involving a structural element shall be completed by the General Contractor.
H. Ground Mounted Equipment pads for the work of each contract shall be the work of each contractor for its own work.
I. Roof Mounted Equipment Curbs for the work of Each Contract shall be the work of each contract. Flashing of Roof Mounted Curbs is by General Contractor.
J. Painting for the work of each contract shall be the work of the General Contractor.
K. Cutting and Patching – Provided under each contract for its own work. Exterior Patching of Penetrations through exterior assemblies shall be by General Contractor. Patching in finished surfaces to be the work of the General Contractor.
L. Through-penetration fire-stopping and thermal insulation for the work of each contract shall be provided by the General Contractor.
M. Noise Control: Each contract shall be responsible to control noise that may be disruptive the operation of the adjacent existing Building, and the adjacent residential properties. Coordinate with Owner in advance regarding timing of noisy work.
    1. When using gasoline powered equipment inside an occupied building, this shall be limited to times when the building is not occupied. Alternatively use electric or compressed air powered equipment.
N. Dust and Smoke Control: Each contract shall be responsible to control dust and smoke production and distribution in occupied areas of the building that require work. Do not do work that produces dust, smoke or other airborne particulates without adequate control facilities. Protections include but are not limited to:
    1. HEPA vacuums to collect dust.
    2. Temporary dust enclosure.
    3. Negatively pressurize the space and exhaust to a location not disruptive to the Owner.
    4. Employ water spray for concrete saws.
    5. When using gasoline powered equipment inside an occupied building, this shall be limited to times when the building is not occupied. Alternatively use electric or compressed air powered equipment.
    6. Comply with all current OSHA requirements for smoke and dust control.

O. Protection of Ceilings: Each contract shall be responsible to remove, carefully store and reinstall ceilings in rooms with above ceiling work for that contract where the ceiling in that room is indicated as existing to remain or has been newly installed. Where ceilings are damaged, the cost of replacement or repairs will be divided equally between prime contractors with above ceiling work in that room.
   1. Where a Prime Contractor requires extended access above a newly installed ceiling, that Contractor shall coordinate with the GC to not install the permanent ceiling panels, and that contractor shall provide and install temporary ceiling panels in place of the permanent ceiling panels. Temporary ceiling panels can be salvaged from demolition work (if applicable), or reused from some other source, or may be the lowest cost panel available to that Contractor. When access is no longer required, that Contractor shall remove the temporary panels and coordinate the permanent installation of ceiling tiles with the GC.

P. Concealed sealants for the Work of each contract shall be provided by each contract for its own Work. Comply with Division 07 requirements for sealants.

Q. Contractors' Startup Construction Schedule – Within ten (10) working days after startup horizontal bar-chart-type construction schedule submittal has been received from Project coordinator, submit a matching startup horizontal bar-chart schedule showing construction operations sequenced and coordinated with overall construction.
   1. Rough-ins, backfill and compact any trenches.

A.8.2. Substitutions – Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the work.
   A. The General Construction Contract shall coordinate applicable substitutions by other contractors.

A.8.3. Temporary Facilities and Controls – In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Section 015000 "Temporary Facilities and Controls," each contractor is responsible for the following:
   A. Building Permit (County responsible for securing permit and cost for permit).
   B. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section.
   C. Each Prime Contractor shall provide their own heating and related fuel to their respective temporary field offices.
   D. 2. Electrical Contractor to install and connect temporary power and meter to all Prime Contractors' and Construction Manager field offices. Utility charges to be paid for by Owner.
   E. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
   F. Temporary enclosures for its own construction activities.
   G. Staging and scaffolding for its own construction activities.
   H. General hoisting facilities for its own construction activities, up to 2 tons (2000 kg).
   I. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
   J. Progress cleaning of work areas affected by its operations on a daily basis.
   K. Secure lockup of its own tools, materials, and equipment.
   L. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

A.8.4. Temporary Heating, Cooling and Ventilation
A. Mechanical Contractor is responsible for the temporary HVAC.

A.8.5. Use Charges – Comply with the following:
A. Sewer Service – Cost for sewer service use by all parties engaged in construction activities at Project site will be provided and paid for by Owner.
B. Water Service – Cost for temporary water service from owners existing water service, for water used by all entities engaged in construction activities at Project site will be provided and paid for by the Owner.
C. Electric Power Service – Cost for electric power service from Owners existing electric service, for electricity used by all entities engaged in construction activities at Project site (excluding temporary HVAC) will be provided and paid for by the Owner.
D. Fuel Service – Each contractor will be responsible for providing and paying for all fuel for its own work and contractor using the equipment consuming the fuel.
E. Gas Service – Cost for gas service from Owners existing gas service, for power used by all entities engaged in construction activities at Project site (excluding temporary HVAC) will be provided and paid for by the Owner.

A.8.6. The Contractor responsible for installation of the systems and equipment is responsible for commissioning each system. The minimum commissioning requirements in accordance with Division 01 and other specific project requirements, including coordination and verification, shall be the responsibility of the Contractor.

9. Multiple Prime Contracts Coordination Clarifications

A. To the extent that the work of all of the contracts represents a complete and integrated whole, each Prime Contractor shall become thoroughly familiar with all of the construction documents. Work of a particular contract shall be substantially located on the documents referenced below, but such references do not relieve each Contractor for responsibility to provide work in compliance with requirements on all of the documents as follows:

1. Information contained on any construction document shall be enforceable on each Contractor as indicated on drawings, by reference to contractor designations (GC, MC, PC, and EC).

2. Dimensional information on the Architectural, MEP/FP and Site drawings that relates to the work of a particular contract shall be the responsibility of that Contractor to install the item where located. In the absence of specific dimensional information on the Architectural, MEP/FP and Site plans for exposed items provided by the HVAC, Plumbing, Fire Protection and Electrical Contracts, consult Architect, Engineer, or Construction Manager for decisional requirements before installing exposed item.

3. 3. In case of conflicts, assignment of responsibilities shall be at the sole interpretation of the Architect, Engineer, or Construction Manager.

B. General Contractor shall furnish and install lintels and structural supports required for openings and recesses in new construction to allow the passage of the Work of his

Contract and the Work of the Plumbing, Fire Protection, HVAC, and Electrical Prime Contracts.

C. General Contractor shall provide chases and openings 12” x 12” or larger for equipment in new construction, including all roof areas, as directed, supervised, located, marked, and configured within the project structure, by the Plumbing, Fire Protection, HVAC, and Electrical Prime Contractors' personnel on site. These openings shall be sealed by the prime contractor requiring the opening. All sleeves, conduits, and sealing of the same shall be furnished and installed by the prime contractor that requires the access for installation of systems. Roofing Subcontractor to the GC shall perform cutting and patching of roof materials as directed by the other Prime Contractors for the implementation of their work.

D. The Prime Contractors shall be responsible to seal all roof openings. GC and Roofing Subcontractor are responsible up to curb flashings. The HVAC Contractor shall layout all openings and curbs and shall furnish all roof curbs to GC for installation. GC shall provide all blocking and accessories to install curb(s). Roofing subcontractor will provide all permanent roofing and flashing to the curbs. HVAC Contractor is responsible to seal any temporary or permanent openings and install new equipment keeping the opening watertight at all times.

E. During placement of concrete slabs, each Prime Contractor that has rough-in requirements in the slab shall provide on-site personnel while slabs are being poured to direct, supervise, locate, mark, and configure rough-in requirements. Sleeves required for floor, wall, and roof penetrations shall be furnished and installed by the Prime Contractor(s) that require the sleeves. The Prime Contractor using the sleeves is responsible for installing sealant, fire-safing, and/or escutcheons necessary for a finished installation.

F. Prime Contractors who fail to properly coordinate their work in new construction work and whose work requires an opening, or recess, in completed construction shall be responsible to provide that alteration; to furnish and install lintels and structural supports required; and to patch the construction to match the completed unaltered.

G. General Contractor shall apply sealant around wall mounted outside air intake louvers provided and installed by the HVAC Contractor.

H. General Contractor shall provide sanitary and storm sewer system from a point five feet outside the perimeter of the building, unless noted otherwise. Plumbing Contractor shall provide sanitary and storm system within building, including underground to a point five feet outside the building perimeter, unless noted otherwise, and shall make final connection to storm and sanitary system.

1. General Contractor shall provide exterior stormwater conveyance including exterior gutters, downspouts, and leaders to below grade.
2. General Contractor shall provide below grade drainage as shown on the Civil drawings.

I. General Contractor shall provide domestic and fire suppression water supply system from a point five feet outside the perimeter of the building unless noted otherwise. Plumbing Contractor shall provide plumbing water supply system within building and underground to a point five feet outside the building perimeter and shall make final connection to water supply system. The Fire Protection Contractor shall provide fire

suppression system within building and underground to a point five feet outside the building perimeter, unless noted otherwise, and shall make final connection to water supply system.

J. General Contractor responsibilities for gas service shall be excavation/trenching, installation of screening bed for gas piping and backfill of any trenching or related excavation for the gas line installation. All work to be in accordance with PECO specifications and requirements.

K. Plumbing Contractor shall provide all gas service piping throughout building and shall make final connections to equipment.

L. The Electrical Contractor shall lock out and tag circuit breakers and switches and shall check cables and wires to ensure they are de-energized to ground potential before Work begins.

M. Plumbing Contractor shall provide devices for equipment such as hose bibbs, water conditioner, water filter, and pet cock for icemaker.

N. Interior concrete bases and pads required for plumbing, fire suppression, heating, ventilation, and air conditioning, and electrical equipment shall be provided by the contractor installing the equipment unless noted otherwise.

O. General Contractor shall provide all exterior concrete pads and bases with exception of exterior light bases, generator pad, and transformer pad. Exterior light pole bases, generator pads, and transformer pads are by the Electrical Contractor.

P. HVAC and Plumbing Contractors shall provide control interlock wiring for their associated system equipment.

Q. Electrical Contractor shall provide disconnect switches for HVAC and Plumbing system equipment except where such items are factory installed as an integral part of the equipment.

R. Electrical Contractor shall provide manual motor starters, or magnetic motor starters, for HVAC and Plumbing equipment except where such equipment is provided with factory installed starters as an integral part of the equipment or equipment control panel. Variable frequency drives shall be an integral part of HVAC equipment and HVAC variable speed pumping package.

S. Electrical Contractor shall provide fuses for disconnects and disconnect/starter switches. HVAC and Plumbing Contractors shall furnish the Electrical Contractor with required motor data to properly size and select fuses and overload protection in accord with the National Electrical Code requirements. HVAC and Plumbing Contractors shall furnish to the Electrical Contractor the equipment manufacturers' circuit protection data.

T. Where fireproofing is indicated for the project, each Prime Contractor shall install clips, hangers, supports, sleeves, runners, and other items required prior to installation of fireproofing. Each Prime Contractor shall protect fireproofing material; damages to fireproofing shall be repaired by the General Contractor and charged to the Prime Contractor responsible for the damage; this includes items installed out of sequence.

U. Plumbing, Fire Protection, HVAC, and Electrical Contractors shall provide miscellaneous steel members for support of hanging systems installed under their contract and shall reinforce joists for non-panel point concentrated loads. When run parallel to joists, hanging systems shall be supported from steel installed perpendicular to joists and spanning a minimum of three (3) joists. All miscellaneous steel required shall be provided by contractor installing the systems under their contract; do not use joists for support. Supporting from metal roof deck and deck systems is prohibited.

V. General Contractor shall provide door louvers.

W. HVAC Contractor shall set controls, panelboards, and appurtenances installed in pipelines and ductwork and shall provide control wiring.

X. Electrical Contractor shall provide devices, wiring within casework, and final connections casework as provided for in the Contract Documents.

Y. Plumbing Contractor to provide all fixtures, traps, etc. to provide all installation and final connections of sinks, faucets, and fittings. Coordinate this work with the General Contractor as provided in the Contract Documents.

Z. Fire Protection Contractor to coordinate tie-in of sprinkler system to fire alarm system with Electrical Contractor. Plumbing Contractor to provide flow and tamper switches for connection to fire alarm system.

AA. Plumbing, HVAC, and Electrical Prime Contracts shall furnish any access panels which are required for access to their work. Coordinate opening requirements with the General Contractor for installation by GC.

BB. General Contractor to furnish and install all exterior vents and louvers.

CC. The disconnection and/or reconnection of existing equipment shall be by the Plumbing/ HVAC/ Electrical Contractor as applicable.

DD. General Contractor to clean and provide waxing for tile floors as indicated on the Construction Documents.

EE. All roofing work will be performed by GC:

1. GC shall coordinate all work in accordance with project phasing requirements and scheduled activities of all other contractors. GC shall perform cutting and patching of all roofing materials including metal deck. Any structural reinforcement required is by the General Contractor.
2. The GC shall be responsible to maintain watertight conditions between the roof and curbs, pipes, and conduits for both permanent and temporary flashing. The MC, PC, and EC shall be responsible for providing temporary enclosures that are watertight for all roof penetrations and openings that are part of their scope in order to maintain watertight conditions beyond the roofer's flashings. GC is responsible to install all HVAC curbs and required leveling blocking. HVAC to furnish curbs and layout. GC responsible for up to curb flashing.
3. Reference Article 1.7.B of this Section for additional requirements.

1. MULTIPLE PRIME COORDINATION FOR ELECTRONIC/ELECTRIC TEMPERATURE CONTROLS, Division 23

A. The HVAC Contractor is defined herein to include the work of the Mechanical Contractor, H.C., M.C., ATC Sub-Contractor, and/or BAS Contractor.

B. The HVAC Contractor shall provide wiring, fiber, and data cable between all Ethernet Network Controllers Standalone Digital Control Units, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, and other accessory equipment, along with a complete system of electrical interlocking wiring to fill the intent of the specification and provide for a complete and operable system as specified in Division 23.

C. The Electrical Contractor shall provide electric power wiring to new plumbing and HVAC equipment. HVAC Contractor shall provide electric power wiring and control wiring for ATC equipment and devices.

D. The HVAC Contractor shall provide all interlock wiring specific to equipment.

A.9.1. Work in ALL Contracts includes, but is not limited to, the following:

A. Permits and Inspections: The plans will be submitted to Lower Providence Township for a plan review by the Architect. Upon award, each successful prime contractor must complete any applicable permit forms (and business licenses if required) and submit to the Lower Providence Township and obtain the approved plans. Building permit and inspection fees will be paid for by the Owner. Any additional costs incurred due to failed inspections shall be paid by the prime contractor.
Any required contractor or business license fees required by the municipality are to be paid for by each prime contractor.

B. See the “Milestone Date Schedule” for mandatory completion dates throughout the duration of the project. The schedule must be held. There will be no exceptions.

C. Each prime contractor is responsible for importing any and all material required for their work including cost of the material, hauling placement and compaction.

D. All utility company tap-in or new service fees such as electric; natural gas ; sanitary sewer and water service are to be paid for by the Owner.

E. Construction testing shall be provided by the Owner.

F. HVAC Testing, adjusting and Balancing and Commissioning Verification shall be provided by the Mechanical Contractor. Each Contractor is responsible for the commissioning of their equipment and systems.

G. Each prime contractor is responsible for offsite storage of their own materials. Onsite storage may only be permitted as space allows. Construction Manager will approve storage locations. Construction Manager reserves the right to deny use of storage.

H. Each prime contractor shall be responsible for their own drinking and washing facilities as required.

I. General Contractor (GC) shall provide all temporary sanitary facilities for all prime trades to use.

J. Each prime contractor shall be responsible for their own daily clean-up.

K. Each prime contractor shall remove all packaging or protective film on all of their finishes just prior to final cleaning. GC shall provide all final cleaning for move-in condition by the Owner. Final cleaning includes but is not limited to: removal of all debris; vacuuming of all floors; wet cleaning, stripping and 2-coats of wax on all vinyl floors; ceramic floors mopped and cleaned accordingly; all fixtures cleaned and free of dust; all cabinets vacuumed of any dust or debris; all horizontal services

wiped cleaned; all windows (glass and frames) cleaned inside and outside; all exterior surfaces cleaned and dirt free including sweeping and power washing as required.

L. Each prime contractor is responsible for their own as-built drawings.

M. Each and all primes are responsible for all drawings for coordination and layout purposes.

N. Each Prime contractor is responsible for all temporary barricades, pedestrian protection, lockable storage areas, etc.as it pertains to their work. As Project Coordinator, GC will coordinate these efforts. General Contractor is responsible for all temporary barricades, pedestrian protection, etc. for all phases of work as it relates to employees and visitors entering, exiting and traveling throughout the building and outside the building.

10. General Construction Contract (GC)

A.10.1. Work of the General Construction Contract includes, but is not limited to, the following:

A. Work not identified as work under other contracts. Add all work shown on structural planes, all duct chases and platforms.
B. Selective general construction demolition as described in drawings and all other demolition not noted by others..
C. All site related work, including but not limited to concrete pads, bollards, ramps, railings, signage, fencing, striping, etc. as indicated on the drawings.
D. GC is responsible for all required concrete foundation and or pads for outdoor ground set mechanical equipment including excavation, trenching, backfill and subbase.
E. Motor operated gates and all associated work (foundations, pads, gate operators, etc.).
   1. Coordinate ground loop installation with Owner's Access Control Vendor.
   2. Coordinate electrical requirements and conduits for operator with EC and/or Owner's Vendor.
F. Construction waste management for the entire Project and implementation of a Construction Waste Management Plan (CWMP) for the Project. Coordination and preparation of final CWM report with information provided by all Prime Contractors.
E. Site improvements, including roadways, parking lots, site development furnishings and equipment, pedestrian paving, and landscaping.
F. Site utility piping and trenches shown on site drawings or referenced from site drawings.
G. Excavation and backfill of all site and utility trenches unless noted as responsibility of other contractors.
H. Site water supply and distribution.
I. Site sanitary sewer, sanitary pump, and pump connections and accessories.
J. Site storm sewer.
1. . Lawns and landscaping.
2. Asphalt and concrete paving and curbs.
G. Site signage as indicated.

Foundations, including footings, foundation walls.
Slabs-on-grade, including earthwork, sub-drainage systems, and insulation.
Below-grade building construction, including excavation, backfill, and thermal and moisture protection.
Superstructure, including floor and roof construction.

Insulation and fireproofing.
Exterior closure, including walls, doors, windows, sheathing, thermal and moisture protection, and exterior finishes.
Masonry work, rough and finish carpentry.
Framing for all roof and floor openings and supported equipment, including coordination for all roof work.
All roofing, scuttles, roof drains, roofing accessories, installation of HVAC roof curbs, all blocking required for installation.

Interior construction, including partitions, doors (wood, hollow metal, aluminum, etc.), fittings, finish, hardware, and glazing.
General floor flash patching and leveling. If excessive amounts of work are uncovered, refer to Unit Prices, Section 01 2200.
Fire suppression specialties and fire-rated framing and glass.
Stairs, including railings and finishes.
Finishes.
Lockers.
Furnishings, including casework, specialty casework, and window treatments.
Firestopping of General Contractor work.
Temporary fire protection including fire extinguishers.
Openings including windows, doors, and hardware. Provide all aluminum windows, storefronts, entrance doors, curtainwalls, glass, and glazing.
Specialties.
Starting, commissioning, adjusting, and training of all General Construction systems and equipment in accordance with manufacturers' recommendations and in conjunction with Owner's Commissioning Verification and Testing Agent(s).
Provide all drywall, metal studs, insulation, wood, acoustical ceilings and grid.
Provide all expansion joints and covers.
Installation of Owner-furnished items as noted on the plans and specifications.
Provide all blocking necessary to install Owner-furnished items.

H. GC is responsible for all caulking and sealing of all penetrations, expansion joints and transitions between dissimilar materials.
I. GC is responsible for all roofing, waterproofing, and damp proofing. Includes cutting and patching for MC provided roof top equipment.
J. GC to provide signage as indicated in Temporary Facilities and Controls Specification Section 01 5000
K. GC is responsible to protect all adjoining properties and Owner's existing property exterior to the building. The GC shall video the building and property prior to construction to identify any areas of concern and also video the building and property upon completion. The property at the end of construction shall be in the same condition as the start of the project. Any necessary repairs will be the responsibility of the GC.
L. GC is responsible for safe pedestrian access along the entire frontage of the building, access to the front door for current tenants and their patrons and all internal and external site access for the duration of the project.
M. GC is responsible for all finishes indicated on the Architectural drawings, including but not limited to ceilings, walls, and any other finish type work.
N. GC shall be responsible for all sprinkler head penetrations that relate to new and existing Fire Protection drawings. PC shall verify all locations prior to install and/or adjustments.
O. PC is responsible for the Fire Protection. The GC shall be responsible for

coordinating with the scope of the PC needed.

A.10.2. Temporary facilities and controls in the General Construction Contract include, but are not limited to, the following:

A. Dust and all other partitions to protect building employee areas and areas of patrons are required. All necessary controls must be in place.
B. Winter Conditions.. The schedule for this work must be maintained. The GC is responsible for snow and ice removal of all areas designated for construction.
C. GC is responsible to maintain lawn areas within the construction area.
D. GC is responsible for pest control within the construction area.
E. Refer to Section 01 5000 Temporary Facilities and Controls, for additional requirements.

11. Mechanical Contract (MC)

A.11.1. Work of the Mechanical Contract includes, but is not limited to, the following:

A. All Work as specified in the contract documents.
B. HVAC Systems and Equipment as shown and specified
C. HVAC instrumentation and controls.
D. Starting, Commissioning, adjusting, and training of all HVAC equipment
E. All exhaust air systems.
F. Mechanical connections to equipment furnished by other contracts.
G. Final low voltage wiring and electrical connections to all heating, ventilating and air conditioning equipment as required.
H. Roof cutting and patching by GC.
I. Selective demolition of all HVAC per plans
J. Preparation of ductwork and HVAC/Electrical coordination drawings.
K. Firestopping of HVAC work.
L. All existing and new duct work must be professionally cleaned prior to turnover of the system to the Owner.
M. MC shall be responsible for the disassembling and reassembling of any equipment related to their scope of work that does not fit in the accessible routes (Doors, Elevator, Stairs to Attic Area)
N. MC shall be responsible for coordinating with the Lower Providence Township, CM, and Architect on the requirements of having any reassembled equipment and following the UL Certification Guidelines.
O. MC shall implement the certification schedules into the Project Schedule to prevent long lead times and any delays with startup dates.
P. PC is responsible for the Fire Protection. The MC shall be responsible for coordinating with the scope of the PC as needed.

A.11.2. Temporary facilities and controls in the Mechanical Construction Contract include, but are not limited to, the following:

A. Temporary Heating, Ventilation, and Cooling

1.10. Plumbing Contract (PC)

A. The Work under the Plumbing Construction Contract includes all construction and other activities traditionally recognized as plumbing work required by any of the Contract Documents including, but not limited to, the plumbing drawings, specification Divisions

00, 01, 02, 03, 07, 11, 12, 13, 21, 22 and 31 except when specifically assigned to another contract for construction. Work in the Plumbing Contract includes, but is not limited to, the following:

A. All work as shown on the Plumbing drawings.
   i. Storm sewer and water service to five (5) feet outside building.
   ii. Domestic water distribution, including main water service systems.
   iii. Plumbing fixtures including domestic water heater, combustion air, and vent.
   iv. Sanitary waste.
   v. Natural gas piping. PC responsibilities for gas service shall be as stated on the Drawings.
   vi. Stormwater drainage to five (5) feet outside building.
   vii. Plumbing connections to equipment furnished by the General Construction Contract, Plumbing Contract, Fire Protection Contract, HVAC Contract and Electrical Contract.

1. Preparing of plumbing drawings and assisting HVAC Contractor in preparation of coordination drawings.
2. Provide temporary water service for construction per Temporary Facilities.
3. Contractor shall include temporary feeds (including additional piping and valves) and connection to permanent system if required.
4. Perform all starting, commissioning, testing, adjusting, balancing, and training of all plumbing systems and equipment in accordance with the manufacturers' recommendations and in conjunction with Owner's Commissioning Verification and Testing Agent(s).
5. Firestopping of Plumbing Contractor Work.
6. Provide temporary water service for construction per Temporary Facilities.
7. Contractor shall include temporary feeds (including additional piping and valves) and connection to permanent system if required.
8. Perform all starting, commissioning, testing, adjusting, balancing, and training of all plumbing systems and equipment in accordance with the manufacturers' recommendations and in conjunction with Owner's Commissioning Verification and Testing Agent(s).

A. Coordinate work with all contractors including, but not limited to electrical, general and HVAC contractors. Coordinate and confirm locations and rough-in for all work with all contractors. Make location adjustments as required.
B. The PC shall coordinate with the EC on wiring and connections for new and existing as needed.
C. Selective demolition of all plumbing fixtures as shown in the plans.
D. All Plumbing fixtures as shown on the plans.
E. Domestic water distribution modifications as indicated on the plans.
F. Sanitary re-routing, waste, and vents as shown on the plans.
G. Special Plumbing systems including the following:
   1. Natural gas distribution from the main to the Generator.
   2. Natural gas distribution revisions as shown on the plans.
H. Plumbing connections to equipment furnished by other contracts.
J. Low voltage final electrical connections to all plumbing contract's supplied electrically powered equipment.
K. Existing and new sanitary lines must be cleaned and videoed professionally prior to turnover of the system to the Owner.
L. The PC is responsible for cutting, capping and or removing any existing

lines (Copper, Steel, Aluminum Etc.) that are abandoned that interfere with any new construction and/or new equipment being installed.

M. PC shall coordinate with all trades and to include the Owner and CM as needed.

10.10.2 Temporary facilities and controls in the Plumbing Construction Contract include, but are not limited to, the following:

A. Piped Sewerage and Drainage.
B. Piped Gas service.
C. Piped Water service.
D. Plumbing Connections to existing systems and temporary facilities and controls furnished by other contractors.
E. Temporary water during construction.

10.11Fire Protection Scope

A. The Work under the Fire Protection scope is by the PC, and includes all construction and other activities traditionally recognized as fire protection work required by any of the Contract Documents including, but not limited to, the fire protection drawings, specification Divisions 00, 01, 02, 03, 07, 11, 12, 13, 21, 22, 31, and 33, except when specifically assigned to another contract for construction. Work in the Fire Protection scope includes, but is not limited to, the following:

a. Preparing of sprinkler drawings and assisting HVAC Contractor in preparation of coordination drawings.
b. Fire suppression sprinklers including pumps, sprinkler piping, heads, flow and tamper switches, corrosion mitigation system, trim, accessories, and support.
c. Fire suppression hydraulic calculations to size fire suppression system.
d. Perform all required Fire Protection system flushes and fills at the completion of each Phase.
e. Fire suppression sprinklers including pumps, sprinkler piping, heads, flow and tamper switches, corrosion mitigation system, trim, accessories, and support.
f. PC shall coordinate with the GC on all penetrations for new and existing sprinkler heads.

1.11. Electrical Contract (EC)

A. The Work under the Electrical Construction Contract includes all construction and other activities traditionally recognized as electrical work required by any of the Contract Documents including, but not limited to, the electrical drawings, specification Divisions 00, 01, 02, 03, 07, 08, 11, 12, 13, 14, 26, 27, 28, 31 and 33 except when specifically assigned to another contract for construction. Work in the Electrical Contract includes, but is not limited to, the following:

a. Site excavation required for electrical systems.
b. Site electrical distribution.
c. Site lighting including site pole concrete footing and bases.
d. Site conduits, ducts, handholes for lighting, power, communications, and security.
e. Conduit, pull string, wiring and electrical connections to all exterior motor-operated access gates. Coordinate with Owner’s Vendor(s).
f. Electrical distribution.

g. Electrical grounding.
h. Lighting and power branch wiring.
i. Electrical rough-in, including conduits, pull wire in conduits, raceways, cable trays, backboxes, 120V power for Telecom, Security, and Audio/Visual systems.
j. Special electrical systems, including the following:

- Packaged natural gas engine emergency generator systems, including automatic transfer switches and temporary generator connection equipment.

- Complete Access Control and CCTV security systems, including all devices, equipment, wiring, etc.

k. Electrical connections to equipment furnished under other contracts.
l. Structural supports, hangers, sleeves, and inserts for new electrical systems and components.
m. New sleeves through existing exterior walls for all electrical components.
n. Perform all starting, commissioning, testing, adjusting, balancing and training of all electrical systems and equipment in accordance with the manufacturers' recommendations and in conjunction with the Owner's Commissioning Verification and Testing Agent(s).
o. Luminaires, lighting controls and all accessories.
p. Fire detection and notification systems, including but not limited to smoke detectors, carbon monoxide detectors, pull statons, horn/strobes and strobes.
q. Conduits and raceway for special systems as required.
r. Emergency lighting systems and exit signs.
s. Coordinate work with all contractors including, but not limited to plumbing, general and HVAC contractors. Coordinate and confirm locations and rough-in for all work with all contractors. Make location adjustments as required.
t. Conduits, raceways, and pathways for all work as specified and required.
u. Raceways for all work.
v. Spare site underground conduits.
w. All rough-in including conduit, and back boxes for all low-voltage work.
x. Floor and wall boxes for all work.
y. Wiring, terminations, accessories for complete CCTV system. (conduit and Cat 6 cable).
z. Furnish and install all accessories, hangers, Velcro wraps, etc.
aa. Furnish and install racks, patch panels, cross connect and punch blocks.
bb. Furnish and install wall jacks & face plates.
cc. Provide electrical dimensions and drawings and assisting HVAC Contractor in preparation of coordination drawings.
Firestopping of Electrical Contractor Work.

1. Provide equipment and all necessary wiring for interfacing of the following systems:

   a. HVAC equipment
   b. Temperature control
   c. Plumbing equipment

a. The EC is responsible for maintaining power to all areas of the occupied building for all phases of the project. Also see Section 01 5000 “Temporary Facilities and Controls” for temporary power needs.
b. Coordinate pole mounted utility transformer installation and secondary cable terminations with local utility.
c. Coordinate, furnish and install conduit, ductbank vaults, etc. for underground power coming onto the site and all underground power to new transformer and electrical switchgear as shown on drawings and in compliance with PECO requirements.
d. Coordinate work with all of the Owner’s vendors and sub-contractors including, but not limited to Telecom, Security, and Audio Visual. Coordinate and confirm locations and rough-in for all work with all vendors and sub-contractors. Make location adjustments as required.

B. All Work as shown on the Electrical drawings
C. Selective demolition in portion of existing building to be altered.
D. Site electrical distribution including all site trenching conduit installations, backfilling, and compaction.
E. Site lighting and building lighting.
F. Site communications and security
G. Electrical service and distribution.
H. Special Electrical systems, including all conduit and pull strings for data connections.
I. High Voltage Electrical connections to equipment furnished by other contracts.
J. Coordinate electrical service to the building with PECO. All work necessary to gain service to the building will be the responsibility of the EC.
K. Coordinate with Owner’s Vendor on access control and security cameras. Electrical Contractor per specifications will provide equipment, programming, recording equipment, POE switches and mounts for access control and CCTV systems. EC shall wire and install all devices.
L. All required work related to Owner’s Vendor’s audio and video installation. Refer to Owner’s Vendor’s plans and Design Professionals’ plans for scope of work. Electrical Contractor (EC) is responsible for all coordination with Owner’s Vendor.
M. EC to coordinate with PC on Fire Protection. EC shall be responsible for reconnection to any boxes, wire pulls as needed.
N. PC is responsible for the Fire Protection. The EC shall be responsible for coordinating with the scope of the PC as needed.
O. The EC is responsible for installing all equipment pertaining to their scope, it is the EC’s responsibility for all means and methods of deliverables and to coordinate with the Manufacturer and County on mobilizing, disassembling, and reinstalling all equipment as needed. The EC shall be responsible for transporting all electrical equipment stored by the County to the site and assemble as needed.
P. EC shall be responsible for coordinating with Upper Providence Township, the CM and the Electrical Design Professional on the requirements of having any reassembled equipment and following the UL Certification Guidelines.
Q. EC shall implement the certification schedules into the Project Schedule to prevent long lead times and any delays with startup dates.

1.1.2. Temporary facilities and controls in the Electrical Construction Contract include, but are not limited to, the following:
A. Electric power service and distribution as necessary for construction.
B. Lighting and temporary lighting that meets OSHA requirements and temporary

lighting as required for drywall installation. Existing fixture may be used for temporary lighting as long as they are secured and properly removed post construction.

1.2 OWNER-FURNISHED PRODUCTS

B. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections. Owner furnished products also includes existing items to be relocated by the Contractor (OFCR).

1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

C. Owner-Furnished, Contractor Installed Products; (OFCI):

1. Residential Appliances, unless noted otherwise on the drawings.
2. Furniture.
3. Other items as noted on the drawings.

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SECTION 01 2100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Owner Contingency allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
2. Division 1 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
3. Divisions 2 through 33 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect/CM of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's/CM's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect/CM from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.

B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 OWNER CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect/CM for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead and profit and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

PART 2 – EXECUTION

2.1 LIST OF ALLOWANCES

A. Refer to those indicated on the individual bid forms

END OF SECTION 01 2100

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SECTION 01 2200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 1 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.
2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Division 1 Section "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount stated on the bid form by the Contractor as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Refer to those indicated on the individual bid forms

END OF SECTION 01 2200

SECTION 01 2300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

1. Refer to those indicated on the individual bid forms

END OF SECTION 01 2300

SECTION 01 2500 - SUBSTITUTION PROCEDURES

A. Submissions for approved substitutions will be permitted and processed in accord with Article 10 of Specification Section 002113 “Instructions to Bidders”.

B. Submissions will be "received dated" immediately upon arrival at the office of the Architect.

C. All Submissions must be received ten (10) days prior to bid or they may not be reviewed.

D. Reviewer's General Criteria for review will be:

1. Burden of proof of performance equality and completeness of this submittal is the responsibility of the submitter.
2. Reviewers will not be required to complete the submittal, that is, select from options or between models and lines of products.
3. Reviewer will not be required to seek information from the manufacturer's literature on file in the office, or information from other locations.
4. Product must be equal, or better, in those features and performance which specified product provides.
5. When in the reviewer's opinion, significant deficiencies are established, further review of submitted data is not required.

E. Reviewer will note action (approval or disapproval), the date, and their initials.

F. If a submittal is disapproved, reviewer will make notations that will be adequate to guide a later reviewer to the same conclusion. Sample notations may be: "Submittal vague", "incomplete", or "product equality not substantiated".

G. Submittals received after closing time will be "received dated," marked "late", initialed, and filed without review.

H. Submittals will be filed in the project file until completion of the project, then destroyed.

I. Approval of a substitute item will be communicated to bidders in the form of an Addendum.

TO:

MKSD, LLC
1209 Hausman Road, Suite A
Allentown, PA 18104
Nick Hewes

New Road Construction Management
95 W Court St
Doylestown, PA 18901
Nick Saunders

PROJECT Upper Providence Twp Municipal Complex Renovations

PRIME BIDDER _____

CONTRACTOR/SUPPLIER _____

We hereby submit for consideration, the following product instead of specified item for above project:

SECTION/DRAWING	**PARAGRAPH/DETAIL**	**SPECIFIED ITEM**
_____	_____	

Proposed Substitution: _____

MANUFACTURER'S HOME OFFICE:	LOCAL REPRESENTATIVE:
Address: _____	Address: _____
Telephone: _____	Telephone: _____
Contact: _____	Contact: _____

Attached to this request is product data, specifications, performance tests and data, and color samples. The attached information also includes any modifications of the Contract Documents which would be required if this substitution is utilized for this Project.

The undersigned states that as a Prime Bidder on the above referenced Project the following statements are true.

1. The Prime Bidder has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. That the product manufacturer will provide the same warranty for the Substitution as for the specified Product.
3. That the use of this product will not have an adverse effect on any other trade or Prime Contractor or the Construction Schedule.
4. That the use of this product does not affect the dimensions shown on the Drawings unless specifically stated in the attached information.

Reason for Substitution:

_____

_____

_____

ATTACHMENTS *(If not applicable, write N/A in space provided)*

No. 1 Complete product data, including technical data and laboratory tests, if applicable.

_____

No. 2 Drawings indicating dimensional changes. _____

No. 3 Complete description of changes to drawings and specifications which proposed substitution will require for its proper installation.

_____

No. 4 Necessary samples and substantiating data to prove equal quality, performance, and appearance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance. Differences in quality of materials and construction shall be indicated.

No. 5 List of names and addresses of three similar projects on which product was used, date of installation, and Architect/Engineer's name, address, and telephone numbers.

_____

_____

_____

Fill in blanks below *(Provide attachments if more space is necessary)*

A. Does the substitution affect dimensions indicated on the Contract Drawings?

Yes _____ No _____ If yes, clearly indicate changes:

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

_____

_____

C. What effect does substitution have on other trades, other contracts, and Contract Completion Date?

_____

D. What effect does substitution have on applicable code requirements?

_____

E. List differences between proposed substitution and specified item:

_____
_____
_____
_____

F. Identify manufacturer's guarantees: _____
_____

G. Identify cost impact; Provide attachments showing proposed credit:

_____
_____

Undersigned attests function and quality equivalent or superior to specified item.

CERTIFICATION OF EQUAL PERFORMANCE:

Submitted by: _____ Title: _____

Company: _____

Address: _____

Date: _____

Telephone: _____ E-mail: _____

Signature: _____

. . . . . .

For Use by the Architect/Engineer:

Accepted: _____ Accepted as Noted: _____

Not Accepted: _____ Received Too Late: _____

Reviewer: _____ Date: _____

REMARKS: _____

_____

_____

PART 1 - EXECUTION (Not Used)

END OF SECTION 01 2500

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SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1. Multi Prime Contracts:

General (GC)
Mechanical (MC)
Electrical (EC)
Plumbing (PC)

B. Related Sections: The following Sections contain requirements that relate to this Section.
1. Division 01 Section "Submittals" for requirements for the Prime Contractors.
2. Division 00 Section " Procurement Substitution " for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

2. Within twenty (20) days, when not otherwise specified after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change to the Architect for the Owner's review.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Prime Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Prime Contractor may initiate a claim by submitting a request for a change to Construction Manager/Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section 00 "Procurement Substitution" if the proposed change requires substitution of one product or system for product or system specified.
5. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

1.5 ALLOWANCES

A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in the purchase amount only where indicated as part of the allowance.
2. When requested, prepare explanations and documentation to substantiate the margins claimed.
3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.

5. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Prime Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.
    a. Do not include the Prime Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
    b. No change to the Prime Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

B. Unit Price Adjustment: Refer to Division 01 Section “Unit Prices” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Construction Manager/Architect will issue a Change Order for signatures of Owner and Prime Contractor on AIA Document G731.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Prime Contractor disagree on terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Prime Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2600

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SECTION 01 2900 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Prime Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Schedules: The Prime Contractor's Construction Schedule and Submittal Schedule are specified in Division 01 Section "Submittals."

1.3 SCHEDULE OF VALUES

A. Coordination: Each Prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Prime Contractors' Construction Schedule.

1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Prime Contractor’s Construction Schedule.
b. Application for Payment forms, including Continuation Sheets.
c. List of subcontractors.
d. Schedule of allowances.
e. Schedule of alternates.
f. List of products.
g. List of principal suppliers and fabricators.
h. Schedule of submittals.

2. Submit the schedule of values to Construction Manager 48 hours after the requested by the Construction Manager.

3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments; provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

   a. Project name and location.
   b. Name and Phone Number of Construction Manager
   c. Name and Phone Number of Architect's
   d. Prime Contractor's name and address.
   e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.

      1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.

6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Unit-Cost Allowances: Provide a separate line item in the schedule of values for Allowances. Show as one line item.

8. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Prime Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: See AIA Document A101 for Application for Payment submittal schedule.

C. Application for Payment Forms: Use AIA Document G732 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Prime Contractor. Incomplete applications without action.

    1. Entries shall match data on the schedule of values and Prime Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Submit signed and notarized original copies of each Application for Payment via Procore Invoicing Tool. This shall include waivers of claims and similar attachments when required.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

    1. List of subcontractors.

2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Approved Prime Contractor's Construction Schedule.
5. Schedule of principal products.
6. Schedule of unit prices.
7. Submittal Schedule (preliminary if not final).
8. List of Prime Contractor's staff assignments.
9. List of Prime Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from governing authorities for performance of the Work.
12. Initial progress report.
13. Report of preconstruction meeting.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire the Owner's insurance.
17. Initial settlement survey and damage report, if required.
18. Weekly Payroll Certificates for Public Works Projects, 1st submittal to be notarized.

H. Application for Payment at Substantial Completion: Following Issuance of the Certificate of Substantial Completion, Submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and submittals that shall precede or coincide with this application include: Occupancy permits and similar approvals.
    a. Warranties (guarantees) and maintenance agreements.
    b. Test/adjust/balance records.
    c. Maintenance instructions.
    d. Meter readings.
    e. Startup performance reports.
    f. Changeover information related to Owner's occupancy, use, operation, and maintenance.
    g. Final cleaning.
    h. Application for reduction of retainage and consent of surety.
    i. Advice on shifting insurance coverages.
    j. Final progress photographs.
    k. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

I. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following: Completion of Project closeout requirements.
1. Completion of items specified for completion after Substantial Completion.
2. Ensure that unsettled claims will be settled.
3. Ensure that incomplete Work is not accepted and will be completed without undue delay.
4. Transmittal of required Project construction records to the Architect and Owner.
5. Certified property survey.
6. Proof that taxes, fees, and similar obligations were paid.

7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish, and similar elements.
9. Change of door locks to Owner's access.
10. Weekly payroll certificates for public works projects, final payment to be notarized.
11. Any other itinerary established by the Architect and/or Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2900

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SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures
2. Submittals.
3. Administrative and supervisory personnel.
4. Project meetings.
5. Web based project management system.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections include the following:

1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
3. Division 01 Section 011500 “Field Engineering” for procedures for field-engineering services, including establishment of benchmarks and control points.
4. Division 01 Section 013117A, “Coordination Drawings” for procedures and requirements of the coordination of installation of products and materials provided by separate primes.
5. Division 01 Section 017300 "Execution" for procedures for coordinating general installation and field engineering services.
6. Division 01 Section 017700 "Closeout Procedures" for coordinating Contract closeout.
7. Division 01 Section 017419 “Construction Waste Management” for additional information and procedures.
8. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1) Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2) Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3) Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

E. Each Contractor shall:

1. Perform his Work as mandated by the project schedule to maintain the required sequence and the overall progress of the project.
2. Coordinate Work of his own employees and subcontractors.
3. Expedite his Work to assure compliance with approved schedules.
4. Coordinate his Work with that of other Prime Contractors and work by the Owner.

F. Modifications to the Work made necessary by a Contractor's failure to properly coordinate the Work, shall be made by that Contractor, at no cost to the Owner.

G. Remove Work installed out of sequence that prohibits a separate Prime Contractor the ability to install Work that is dependent on their prior installation of materials or equipment. No additional compensation or time extension will be considered for the uncovering or removal of the out of sequence Work.

H. Each Prime Contractor shall coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on the Contract Drawings. Follow routing shown for pipes, ducts and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

I. Where availability of space is limited, the Construction Manager and each Prime Contractor shall coordinate installation of different components with other Prime Contractors to assure maximum accessibility for required maintenance, service and repair and to meet governing code requirements.

J. Each Prime Contractor shall make adequate provisions to accommodate items scheduled for later installation.

K. Each Prime Contractor shall, in finished areas except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements provided by other Contractors.

L. Each Prime Contractor shall verify utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

M. Each Prime Contractor shall coordinate Testing and Inspection Services:

1. Verify required laboratory personnel are present.
2. Verify tests are made in accord with specified standards.
3. Review test reports for compliance with specified standards.
4. Recommend and administer any required retesting.
5. Submit copies to the Owner, Architect/Engineer, and Construction Manager.
6. Coordinate with Owner's Geotechnical Engineer for compaction and moisture content testing. Notify Geotechnical Engineer in advance of need for testing in accord with Project Construction Schedule.

7. Coordinate with Owner's Inspection Agency for concrete, masonry and steel testing and inspection. Notify agency in advance when testing and inspection is required.

N. Each Prime Contractor shall coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion, and for portions of Work designated for Owner's partial occupancy.

O. Each Prime Contractor shall, after Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accord with Contract Documents, to minimize disruption of Owner's activities.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect/CM for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: Within 7 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
2. Provide list to Owner, Architect, and Construction Manager.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Authorized representatives of Owner, Architect and their consultants; Prime Contractor(s) and their superintendent; major subcontractors and other Owner pre-approved parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing.
d. Designation of responsible personnel.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for processing Applications for Payment.
g. Distribution of the Contract Documents.
h. Submittal procedures.
i. Preparation of Record Documents.
j. Use of the premises.
k. Responsibility for temporary facilities and controls.
l. Parking availability.
m. Office, work, and storage areas.
n. Equipment deliveries and priorities.
o. First aid.
p. Security.
q. Progress cleaning.
r. Working hours.
s. Construction Waste Management Plan activities.
t. Construction IAQ Management Plan activities.

B. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. The Contract Documents.
    b. Options.
    c. Related requests for interpretations (RFIs).
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility problems.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written recommendations.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) Requests for interpretations (RFIs).
        16) Status of proposal requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

3. Reporting: The Construction Manager will distribute minutes of the meeting to each party present and to parties who should have been present. Minutes will include a brief summary, in narrative form, of progress since the previous meeting and report.

    a. The Contractor shall revise the Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting. Contractor shall provide and include a two- week look ahead schedule.

D. Weekly Superintendent Meetings: Attend weekly superintendent meetings scheduled and chaired by the General Contractor.

1. Attendees: In addition to representatives of the Owner and Construction Manager, each contractor and subcontractor responsible for work in the upcoming two weeks to be represented.
2. Agenda: Review the work planned in the next two weeks and other items that may affect work in the short-term including:

    a. Deliveries.
    b. Site traffic patterns.
    c. Subcontractors working at the site.
    d. Maintenance of erosion and sediment control features.
    e. Site cleanliness.
    f. Planned work hours.
    g. Coordination items .

3. At each coordination meeting, the following shall occur:

    a. GC shall provide a two-week look ahead schedule from the current overall CPM schedule listing the tasks start, finish, and total float for the next two weeks.
    b. Each prime contractor superintendent shall be prepared to address the two-week list of tasks and provide their plan for executing each task as per the schedule.
    c. If any task is not going to be met, contractors shall then provide immediate recovery plan which will be incorporated into the overall schedule update.

4. At each coordination meeting, each Prime Contractor is to provide a written two-week look ahead schedule to the General Contractor and Construction Manager for review and comment.
5. The General Contractor shall write meeting minutes for each coordination meeting and distribute them to each Prime Contractor and to the Construction Manager for review within two days after the meeting.

1.7 WEB BASED PROJECT MANAGEMENT

A. Refer to Section 013125 – Web Based Project Management System.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3100

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SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work under the Contract Documents shall be planned, scheduled, executed, reported, and accomplished using the cost and resource loaded “Critical Path Method” schedule, in calendar days (excluding Saturdays, Sundays, and legal holidays). The provisions of the General Requirements, Division 01, and the directions of the Project Coordinator (General Contractor) are to be followed by the Contractor in scheduling and coordinating construction activities. The scheduling Services of the Project Coordinator are part of its contract with the Owner, but nothing herein relieves the obligations of each Contractor to schedule their own construction activities, and nothing herein alters the obligation of each Contractor to resolve all supervision, coordination, and scheduling issues between and among the Sub-Contractors. In addition, the requirements for subordinate coordination responsibilities and scheduling per the Division 01 General Requirements must be followed by all contractors.

B. General Scheduling Requirements: Any of the scheduling requirements including, but not limited to, the format, content, and complexity can be waived or modified by the sole discretion of the Construction Manager and Owner only. Any modification or waiver by the Construction Manager shall not be grounds for any claim by Contractor against Owner, Construction Manager, or Architect. Project Coordinator (General Contractor) shall submit preliminary and final construction schedule and all schedule updates in electronic format with no restrictions for viewing and analyzing using the same software with which the schedule was created. Electronic format shall be submitted to the Construction Manager and to any Contractor that Construction Manager may direct.

C. The General Contractor is designated as the Project Coordinator for this Project unless noted otherwise. The Project Coordinator and other Prime Contractors are responsible for coordination of the Work. The Project Coordinator is responsible for making all coordination decisions not mutually agreed to by all affected Prime Contractors. Disputes between or among the Project Coordinator and one or more other Prime Contractors and disputes in connection with the construction schedule, the furnishing of additional resources to meet the project schedule, job coordination, and all aspects of the means and methods of construction shall be submitted promptly to the Project Coordinator for a final construction decision. The Project Coordinator and the affected Prime Contractor or Contractors shall, in connection with all submissions for a final construction decision, provide actual written notice contemporaneously to the Construction Manager. The final construction decision of the Project Coordinator must, at all times, be consistent with

content and intent of the Contract Documents and the latest accepted schedule. Should the Owner or Construction Manager determine that, in its sole judgment, substantial interests have been placed at risk by the final construction decision of the Project Coordinator, then the Owner or Construction Manager reserves the right to overrule the final construction decision of the Project Coordinator. The exercise of discretion by the Owner or Construction Manager in this regard shall be unchallengeable, subject only to a determination that the decision constituted an abuse of discretion. In all other instances, the final construction decision of the Project Coordinator will be observed, accepted, and fully followed by all Prime Contractors and their Subcontractors on the project, subject only to the commencement of any litigation between the Prime Contractors. The progress of the Work in accordance with the final construction decision of the Project Coordinator shall not be delayed pending litigation between the Prime Contractors. The damage remedy provided in favor of the Project Coordinator or other Prime Contractor shall be exclusive remedy for disputes between the contractors. The contractors, including the Project Coordinator, shall have no right of action against the Owner, Architect, or Construction Manager in connection with such disputes.

D. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.

E. Related Sections include the following:

1. Division 01 Section 011200 "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.
2. Division 01 Section 012900 "Payment Procedures" for submitting the Schedule of Values.
3. Division 01 Section 013100 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
4. Division 01 Section 013300 “Submittal Procedures” for submitting schedules and reports.
5. Division 01 Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.
6. Division 01 Section 017700 "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources and include shop drawing preparation, work

activities, equipment testing, and training and any other actions required for the prosecution of the work.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.
3. Successor activity is an activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains the lowest float valve.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner and shall only be assigned with Owner's representative approval.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include

lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit seven copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's and all consultants and agencies final release or approval.

C. Preliminary Construction Schedule: Submit seven (7) opaque copies and one (1) electronic copy.

1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities. The electronic copy is to be provided with no restrictions for viewing and analyzing using the same software with which the schedule was created.

D. Preliminary Construction Schedule Network Diagram: Submit seven (7) opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

E. Final Construction Schedule: Submit seven (7) printed copies of the initial schedule large enough to show entire schedule for entire construction period. Provide electronic copy if requested.

1. Submit an electronic copy of schedule electronically and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label. The electronic copy is to be provided with no restrictions for viewing and analyzing using the same software with which the schedule was created.

F. Final Construction Schedule Reports: Submit three (3) copies of each of the following computer-generated reports with the Final Construction Schedule. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by Project Phase, Project Area, Prime Contractor, and then early start date. Provide a duration, cost, and total float value for each activity.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

G. Daily Construction Reports: Submit electronic copies at weekly intervals.

H. Material Location Reports: Submit electronic copies at weekly intervals.

I. Field Condition Reports: Submit electronic copies at time of discovery of differing conditions.

J. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduler's Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Construction Manager's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section 013100 "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary schedule. Include submittals required during the first 90 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication.

    a. Show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in Exeter Township's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early or late completion date, unless specifically authorized by Change Order.

C. Each activity on the network shall have indicated for it the following:

1. A single duration, no longer than 20 days (i.e., the single best estimate of the expected elapsed time considering the scope of work involved in the activity) expressed in working days. Normal holidays and weather delays shall be included. One critical path shall be shown for the schedule.
2. An activity identification number will be assigned to each activity. The identification number will be in a format acceptable to Project Coordinator.
3. A brief description of the activity will be included. If this description is not definitive, a separate listing of each activity and a descriptive narrative may be required.

4. Each activity shall be cost loaded to indicate the total estimated budget of the activity. No activity budget shall exceed $50,000. Material and/or equipment costs

to be paid as stored material shall be listed separately. In addition, activities shall be cost-loaded as requested by Owner's representative for payment purposes.

5. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 40 calendar days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
6. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect and Owner's administrative procedures necessary for certification of Substantial Completion.
8. Each activity (except for procurement activities) shall be man-hour loaded with the estimated man-hours to be expended on each activity.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include separate activities for each contract.
3. Work by Owner: Include separate activities for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section 011100 "Summary of the Project." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section 011100 "Summary of the Project". Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Seasonal variations.
    g. Environmental control.

7. Area Separations: Identify each major area of construction for each Phase of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following phase completion and contract milestone dates listed in the contract documents:

    a. Foundation completion.
    b. Structural completion.
    c. Permanent space enclosure.

d. Police Station, New Addition, and Garage
e. New Vestibule at Administration
f. West side of Administration
g. East side of Administration
h. Site Work, EV Charging, Security Fencing, Signage, Canopy (Alternate)
i. Substantial Completion.

E. Milestones and Phases: Include milestones and phases indicated in the Contract Documents in schedule including, but not limited to, the Notice to Proceed, Individual Phase Completion(s), Substantial Completion, Final Completion, and the following interim milestones:

1. All project milestones and phases listed in the Contract Documents.

F. Cost Correlations for Progress Payments: Provide cost loading of the Preliminary and Final schedule as follows:

1. Each activity on the construction schedule shall be allocated a dollar value in accordance with 2.2.C.4, above. Each activity's assigned cost shall consist of labor, equipment, and materials costs, and a pro rata contribution of overhead and profit. The sum of activities costs shall be equal to the total Contract Price. In submitting cost data Contractor certifies that the costs are not unbalanced and that the value assigned to each activity represents Contractor's estimate of the actual costs of performing that activity.
2. The accepted schedule of values shall represent a fair, reasonable, and equitable dollar cost allocation for each activity on Contractor's construction schedule.
3. If it is determined that the cost data does not meet the requirements for a balanced bid breakdown in the opinion of Owner’s representative, Contractor will present documentation substantiating the cost allocation. Cost allocations shall be considered unbalanced if an activity on the construction schedule has been assigned a disproportionate allocation of direct costs, overhead and profit.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using one of the following programs. Microsoft Project is not an acceptable option.

1. Primavera Contractor with cost loaded options.
2. Primavera Suretrak
3. Primavera Project Planner
4. Primavera Expedition

2.3 PRELIMINARY CPM CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within thirty (30) calendar days of date established for the Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Provide construction activities for first 90 days of construction. Include costs for each activity.

2.4 FINAL CPM CONSTRUCTION SCHEDULE

A. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than forty-five (45) calendar days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including each contractor’s personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

B. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a network diagram to identify the critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Within each Phase, include activities and durations for following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for any interim Phase completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

C. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediately preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Dollar value of activity (coordinated with the Schedule of Values).

D. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports and electronic copies on a monthly basis showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.5 FIELD REPORTS

A. Daily Construction Reports: Each contractor shall prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. An account of work performed on the project.
10. Stoppages, delays, shortages, and unusual events.
11. Meter readings and similar recordings.
12. Site visits or inspections by authorities having jurisdiction.

13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction or Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit a request for information to Architect with copy to Construction Manger on CSI Form 13.2A or other form approved by Architect. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare, and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 FIELD REPORTS

A. Contractor is to submit Daily Construction Reports on a daily basis to the Owner’s Representative. Failures to maintain timely or complete reports may result in partial withholding of monthly payment applications.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Requirements for the General Contractor as the Project Coordinator. As Project Coordinator, the Contractor for General Construction shall:

1. Engage a scheduling consultant to perform, for and on behalf of the Contractor, the Contractor’s duties, and responsibilities as Project Coordinator, including

those specifically set forth below. The scheduling consultant shall have a minimum of five (5) years prior experience in the design, preparation, publication, and revision of PCM network schedules, including scheduling experience on multiple prime contracts, multiple phase construction projects. The Contractor shall submit the name, credentials, and experience of its proposed scheduling consultant to the Owner, Architect, and Construction Manager for approval within five (5) days of being awarded the Contract. The Contractor; (a) shall not terminate the engagement of any approved scheduling consultant without at least thirty (30) days prior written notice to the Owner, Architect, and Construction Manager, and then only after submission and approval of a replacement scheduling consultant in accordance with the provisions of this paragraph; and (b) shall not engage any scheduling consultant as to whom the Owner, Architect, and Construction Manager, at any time, make reasonable objection and shall promptly replace such scheduling consultant with another approved in accordance with the provisions of this paragraph.

2. If the Contractor demonstrates to the satisfaction of the Construction Manager that it employs a person with experience and qualifications in the design, preparation, publication, and revision of CPM network schedules, then, upon receipt of written approval from the Owner, the Contractor may assign such employee as the scheduling consultant described herein;
3. Attend and chair meetings at least every two weeks during construction with all separate contractors, the Owner, the Architect, and Construction Manager to review progress and to plan and coordinate the activities of each separate contractor with the Work of the Contractor and of the Owner;
4. Advise the owner, Architect, and Construction Manager of delays or potential delays.
5. Formulate and recommend to the Owner, Architect, and Construction Manager plans, including a revised Project construction schedule, to prevent, minimize, or recover from delays or potential delays.
6. Make recommendations to the Owner, Architect, and Construction Manager concerning whether requests for extensions of time should be granted and the effect such extensions would have on the Project construction schedule.
7. Revise the Project construction schedule to reflect extensions of time granted by the Owner.
8. Resolve objections made by other contractors and make adjustments to the schedule that are mutually agreeable to all prime contractors and the Owner.
9. Prepare monthly schedule updates comparing the actual progress of all Work with the scheduled progress.

B. Scheduling requirements for all Contractors other than the Project Coordinator (General Contractor). All Contractors shall:

1. Within fourteen (14) days after the Notice to Proceed for Construction, prepare and submit to the Project Coordinator and Construction Manager a preliminary construction schedule in a form compatible with the requirements herein. Such construction schedule shall include the Work of the Contractor, show by appropriate notation whenever the commencement, progress, or completion of an activity depends upon the commencement, progress, or completion of another activity (including activities of separate contractors) and show the timely and orderly completion of all Work in accordance with the requirements of the Contract

Documents, including such interim “milestone” dates as are identified therein. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner, the Architect, Construction Manager, and the Project Coordinator and resubmitted for acceptance and incorporation into the project construction schedule prepared by the project coordinator.

2. Within thirty (30) days of the Notice to Proceed prepare and submit to the Project Coordinator and Construction Manager a final construction schedule in a form compatible with the requirements herein for the project Coordinator’s use in submitting the final Construction Schedule.
3. Shall cooperate and participate with the Project Coordinator and the other contractors in connection with all the activities described in this section.
4. Shall notify the Project Coordinator, the Owner, and the Construction Manager in writing if the Contractor objects to the Project construction schedule, or any revision thereto, stating its objection and the reasons therefor within two (2) days after the Contractor’s receipt of the Project Construction schedule or any updates or revisions to which objection is made. In the absence of such timely notice, any such objection shall be deemed waived and released and the Contractor shall comply with the Project construction schedule or revision thereto. If a timely objection is made, the Contractor and the Project Coordinator shall agree to a resolution of the objection within ten (10) days. In the absence of such agreement, the Owner may, in addition to any other rights and remedies under the Contract Documents, appoint the Construction Manager or an independent scheduling consultant to resolve the objection, whose decision shall be final and binding upon the Contractor and the Project Coordinator. All cost and expense incurred by the Owner to resolve such objection shall be charged to and borne in equal shares by the Contractor, the Project Coordinator, and their respective Sureties.
5. Shall not be entitled to claim any damages against the Owner, nor any adjustment in the Contract Time or the Contract Sum in connection with the Project construction schedule, any revision thereto, or any resolution of an objection to either the Project construction schedule or a revision thereto; and
6. Acknowledges and agrees that the Owner has no duty or responsibility toward the Contractor to cause the Project Coordinator to perform or to competently perform its duties and that the Contractor’s sole claim in the event of any failure of the Project Coordinator to perform or to competently perform its duties shall be against the Project Coordinator.
7. Should any Contractor intend or plan to complete the Work, or any portion thereof, earlier than any applicable Completion Date or the Contract Time, Contractor shall give timely and reasonable written notice of this fact to the other Contractors, Project Coordinator and Construction Manager. Project Coordinator shall have the discretion to agree to or reject such early completion plan by Contractor, subject to the rights of Contractor to litigation between prime contractors. The Project Coordinator shall have no duty or obligation to agree to or to cooperate with Contractor regarding any early completion plan or proposal by Contractor and shall not be liable for any damages of Contractor because of the rejection by Project Coordinator of said plan. Earlier completion of any portion of the work shall be promoted wherever feasible and all Contractors must cooperate and accelerate towards earlier completion of any portion of the work unless such work affects the quality of work as determined by the Construction Manager. All Contractors shall cooperate and accelerate work as determined by Project

Coordinator unless quality of work is affected as determined by the Construction Manager. No claims for acceleration to complete early or to meet project schedule will be considered.

C. Contractor's Construction Schedule Updating: At monthly intervals or as requested by Owner's representative, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting. Provide an electronic copy of each monthly schedule update. Provide an indication of the total project float in the schedule on a monthly basis.
2. Include a report with updated schedule that indicates every change including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.
4. Items not ordered by the contractor in a timely manner for incorporation into the Work will not be considered for claims by the Contractor for additional time or costs.

D. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractors with a need-to-know schedule responsibility. Provide an electronic copy to the Construction Manager and distribute to other contractors at the direction of the Construction Manager.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

E. The Critical Path Method type construction schedule will be used to monitor job progress and as a means to make monthly payments to Contractors. Contractor will be responsible for providing all information concerning the sequencing, logic and durations of all activities as well as providing the initial logic network diagram. Once the schedule is accepted, Contractor will be responsible for providing monthly update information on logic, percent complete, actual start and finish dates, and duration changes. Contractor will <u>not</u> be required to produce the computerized printout of the schedule updates. This will be performed by Project Coordinator using information provided by Contractors. Copies of the updated schedule are to be distributed at the progress meetings by the Project Coordinator.

F. From each Contractor's initial schedule submittal and from information received at the monthly schedule update meetings, computerized and dated tabular schedule reports, or updated network diagrams, or bar charts will be produced by Project Coordinator which will be reviewed by each Contractor for accuracy and integrity. It shall at all times remain each Contractor's responsibility to schedule and direct his forces in a manner that will allow for the completion of the work within the contractual period.

G. It should be clearly understood that the initial schedule and all update information must be provided by each Contractor and that this information is a representation of the best efforts of each Contractor and his subcontractors as to how they envision the work to be accomplished. Similarly, all progress information to be provided by and through each Contractor must be an accurate representation of his or his subcontractor or supplier's actual performance. The schedule shall at all times remain an accurate reflection of each Contractor's actual or projected sequencing of work. Once accepted, adherence to the established CPM schedule shall be obligatory upon each Contractor and his subcontractors for the work under this Contract. Owner may require each Contractor to revise the schedule if, in his judgment, the schedule does not accurately reflect the actual execution of the work, or is in violation of any provision of this CPM scheduling specification, and each Contractor shall revise the schedule as often as is necessary during the course of performance of the work without additional cost to Owner.

H. The work shall be started on the date indicated in the Notice to Proceed and shall be executed with such progress as may be required to prevent delay to other Contractors or to the general completion of the project. The work shall be executed at such times and in or on such parts of the project, and with such forces, material, and equipment, as to assure completion of the work in the time established by the Contract. Additionally, each Contractor shall, at all times, schedule and direct his work so that it provides an orderly progression of the work to completion within the specified Contract Time.

I. Each Contractor agrees that whenever it becomes apparent from the current monthly CPM Schedule update that delays to the critical path have resulted and these delays are through no fault of Owner or Owner's representatives, and hence, that the Contract completion date will not be met, or when so directed by Owner's representative or Project Coordinator he will take some or all of the following actions at no additional cost to Owner.

1. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
2. Increase the number of working hours per shift; shifts per working day, or days per week; the amount of construction equipment; etc., or any combination of the foregoing to substantially eliminate the backlog of work.
3. Schedule activities to achieve maximum practical concurrence of accomplishment of activities and comply with the revised schedule.
4. Contractor shall submit for reviewing a written statement of the steps he intends to take to remove or arrest the delay to the schedule. If Contractor fails to submit a written statement of the steps he intends to take or fails to take such steps as required by the Contract, Owner may direct the level of effort in manpower (trades), equipment, and work schedule (overtime) to remove or arrest the delay to the critical path in the accepted schedule, and Contractor shall promptly provide such level of effort at no additional cost to Owner. In addition, should schedule delays persist, Contractor's surety will be asked to attend meetings to update the schedule.

J. In the event the Owner determines that the performance of the Work, the work of separate contractors or of the Owner has not progressed or reached the level of completion required by the Contract Documents, or the Project construction schedule, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation: (1) working additional shifts or overtime; (2) supplying additional manpower, equipment, and

facilities; (3) engaging a scheduling consultant to make recommendations concerning the corrective measures to be taken, with the cost and expense of such engagement to be borne by the Contractor, the separate contractors and their respective Sureties in such proportions as the Architect and Construction Manager may, in their sole discretion, determine to be just; and (4) other similar measures. Such measures shall continue until the progress of construction complies with the required level of completion. The Owner's right to require such measures shall not impose upon the Owner any duty or obligation to the Contractor, its Surety, or any other party. Except as specifically provided in this paragraph, the Contractor shall not be entitled to an adjustment in the Contract Time or the Contract Sum in connection with such measures required by the Owner. If the Contractor (its agents, subcontractors, suppliers, or vendors) has not caused or contributed to the failure of construction to progress or reach the required level of completion, then the Contractor shall be entitled to a Change order for an amount not to exceed the reasonable additional labor cost of any overtime or shift work directed by the Owner under this paragraph. If the Contractor (its agents, subcontractors, suppliers, or vendors) has caused or contributed to the failure of construction to progress or reach the required level of completion, then the Contractor and its Surety shall be liable to the Owner for any and all costs and expenses incurred by the Owner due to any measures directed by the Owner under this paragraph, including the cost of any overtime or shift work performed by the Owner or by separate contractors. The Owner may exercise the rights furnished to the Owner under this paragraph as frequently as the Owner deems necessary to ensure that the progress of construction will comply with the required level of completion. If the Contractor fails to perform its duties as the Project Coordinator adequately or to the Owner's satisfaction, the Owner may, in addition to its other rights and remedies, appoint a substitute Project Coordinator who shall act in the place and with the authority of the original Project Coordinator. In that event, the Owner may, in its sole discretion, choose one of the separate contractors or an independent consultant as the substitute Project Coordinator. The cost and expense incurred by the Owner to engage such substitute Project Coordinator shall be charged to and borne by the Contractor and its Surety.

K. The Contractor's failure to cooperate and participate with the Owner, the Architect, the Construction Manager, and separate contractors in the development and review of construction schedules and updates as provided in this section shall be a material breach of its obligations, entitling the Owner to exercise all rights and remedies under the Contract Documents and applicable law. In no event shall any revision to any construction schedule constitute the basis for an adjustment in the Contract Time or the Contract Sum unless such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

L. The Project Schedule is to be used by the Contractors as a guide and all contractors and sub-contractors shall be responsible to perform work to ensure that the Project is completed by the Project Contract completion date(s) and all milestone dates established in the Contract Drawings are met. Any claims for additional costs associated with completion of the Work within the required Contract time frames will not be considered. The Contractor and all Sub-contractors who feel extra time, in any form such as shift work, overtime, and premium time, is necessary to meet Contract requirements regardless of trade should include these costs in their bids. All Contractors must recognize that although their work might not require shift, overtime, or premium timework for completion within the stipulated time frame, it may be required in order to allow other

Contractors to complete within the time frame. Contractors must allow for these overtime requirements and include the costs necessary to allow the other Contractors to complete within the specified time. Failure to recognize the extra costs in his bid shall not relieve the Contractor from utilizing shift, overtime, or premium time work in performance of his Contract; all costs associated with meeting the time frames indicated in the construction schedules shall be included in the Contract Price. Construction Manager, Architect, and Owner reserve the right to withhold processing of any monthly payment applications from any contractor if schedule compliance is not being strictly adhered to. Such payment may be withheld until the Contractor makes corrective action to comply with project schedule.

M. Contractor Approval and Certification. Approval by Contractor of the preliminary CPM Construction Schedule, the final CPM schedule, and schedule updates shall be evidence of the Contractor's agreement that the proposed schedule or schedule revision to the Construction Schedule is a true and accurate representation of his plan to complete the Work, including all Change Orders that are in Contractor's possession as of the foregoing date, that the schedule or schedule revision fully complies with the requirements of the Contract Documents, that he shall prosecute the Work in accordance with this schedule revision, subject to any change therein which is implemented in accordance with the Contract Documents, and that he has met and coordinated with and obtained the acceptance or approval of said schedule revision by all other parties that are affected thereby.

3.3 NETWORK REQUIREMENTS

A. The CPM Schedule shall show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned by Contractor. The basic concept of the network analysis diagram is to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of succeeding activities. A time scaled precedence format will be followed. The detailed network diagram will be time scaled showing a continuous flow from left to right.

B. The CPM schedule shall include a weather calendar that contains non-working days in addition to weekend and holidays to account for anticipated inclement weather days beyond those normally anticipated for the project area.

C. Failure to include in the CPM schedule any element of Work required under the performance of this Contract shall not excuse Contractor from completing all Work required within the applicable completion time, notwithstanding Owner's network review.

D. A CPM schedule which shows a completion of any portion of the Work prior to the contractual completion date may be accepted but in no event shall be acceptable as a basis for a claim for delay or cost reimbursement against Owner or its representatives by Contractor. The period of time between the Contractor’s baseline accepted CPM schedules projected completion dates and the contractual stipulated completion dates, if any, will be treated as Project Float. The Owner’s right to utilize Project Float is as provided in paragraph 3.8.

E. If a review of the submitted CPM Schedule indicates a work plan which will not complete the work within the time requirements stated in the Contract, it shall be the responsibility of Contractor to revise the CPM Schedule as required and resubmit it until it is acceptable. Failure by Contractor to submit an acceptable schedule may, at Owner's sole discretion, justify the withholding of any partial payment(s) otherwise due under the Contract.

F. Acceptance of the schedule shall not constitute a representation by Owner that the work can be completed as shown on the schedule.

G. The schedules prepared by the Contractor and by the Project Coordinator, if any, under this Article shall be in the form of a CPM arrow network diagram, preferably organized by IJ nodes" and shall include: (1) a shop drawing and submittal schedule noting the relevant submittal, approval, order, fabrication, and delivery durations; (2) integration of the shop drawing and submittal schedule with the installation activity logic in order to determine the effect of delivery on installation of any items of work; (3) the planned progressions of construction work showing the activities and duration of the work of each contract phase and clearly noting any interim milestone dates; (4) the appropriate restraints in order to clearly identify the interrelationships of work and crew and trade flow; (5) logic (CPM arrow network) diagrams summarized into a summary bar chart format that is capable of displaying current progress of all Work; (6) a computerized mathematical analysis of the CPM logic with each monthly schedule responsibility, activity duration, early (target) start date, early (target) finish date, late start date, late finish date, work tasks critical to completion within the Contract Time and any interim milestone dates; and (7) crew sizes and planned labor hours for each activity shown on the schedule. The Contractor shall deliver to the Owner, upon Construction Manager's request and in the format requested by the Construction Manager, copies of all electronic files (including all schedule logic, restraints, and all other electronic data and information used to create and maintain the schedule that the Owner may request) that comprise or relate to such schedules, including the original project schedule, all schedule updates, any recovery schedules, and any schedule revisions.

H. The Project Schedule shall be submitted by the Contractor for all work. All schedule and work items must be in conformance with the project schedule requirements listed in the project manual including any phasing or other milestones provided. The Project Coordinator shall incorporate all contractors' items of work and issue project schedule. Upon written approval of the schedule by the Contractor and Construction Manager and review by the Architect, it shall with respect to time, become the essence of the Contract and the Contractor who does not comply may be held in violation of Article 8, of the General Conditions, "Delays and Extension of Time". The project schedule may be changed or revised only with the written consent of the Construction Manager, Owner, and Architect. If the Contractor does not comply with all the scheduling requirements of the Contract and timelines, the Owner reserves the right to deduct $800.00 from the Contract amount for each day that Contractor does not comply and Owner may also proceed with enforcing other requirements of the Contract including Article 2.5 of the General Conditions of the Agreement. No payment applications will be processed without an approved project schedule accepted by all contractors.

I. Any preparation, review, enforcement, and updating of the project schedule do not make Owner, Construction Manager, or Architect liable to Contractor for time, cost overruns,

or schedule changes which are required to maintain project contract completion date and all milestone dates established in the Project Manual.

J. Contractor is responsible for determining the sequence and logic of activities, the time estimates of the detailed construction activities, and the means, methods, techniques, and procedures to be employed with regard to his portion of the Work. The Construction Schedule shall represent Contractor's best judgment of how he shall prosecute the Work in compliance with the requirements of the Contract Documents. Contractor shall ensure that the Construction Schedule is current and accurate and is properly and timely monitored, updated, and revised as Project conditions and the Contract Documents may require, and as may be directed by Project Coordinator.

K. Contractor shall consult with his major Subcontractors relating to the preparation of his construction plan and Construction Schedule. Major Subcontractors shall receive copies of those portions of Contractor's Construction Schedule that relate to their Work and shall be continually advised of any updates or revisions to the Construction Schedule as the Work progresses. When Contractor submits his Construction Schedule to the Project Coordinator or makes any proposed updates or revisions to such Schedule, it shall be concluded by Construction Manager, Owner, and Project Coordinator that Contractor has consulted with and has the concurrence of his major Subcontractors. Contractor shall be solely responsible for ensuring that all Subcontractors comply with the requirements of the Construction Schedule for their portions of the Work.

L. The Completion and Milestone Dates set forth in the Contract Documents represent only the major items of Work and may include interface dates with the construction activities of others. Completion and Milestone Dates are Contract requirements and are of the essence to the Contract Documents and to the coordination of the Work by the Contractor. Completion and Milestone Dates represent the latest allowable completion time for those portions of the Work to which each Date relates. The Dates are not intended to be a complete listing of all Work under the Contract Documents or of all interfaces with work performed by the Contractors or others. The Contractor shall determine the time requirements for all such interfaces and shall be responsible for planning, scheduling, and coordinating the Work in order to complete in accordance with those requirements.

3.4 SCHEDULE UPDATES

A. A monthly Schedule Update Meeting will be held one (1) week prior to the progress meeting at the construction site to review and update the CPM Schedule. Project Coordinator and Contractor will attend the Schedule Update Meeting. Actual progress of the previous month will be recorded, and scheduling of future work activities will be reviewed. The duration of activities and their logical connections may be revised as needed. Decisions made at these meetings and agreed to by all parties are binding with the exception that no contractual completion dates will be modified without formal written requests and acceptance as specified herein. Contractor must provide the following information for each update at a minimum:

1. Actual start and finish dates for all completed activities.
2. Actual start dates for all started but incomplete activities and estimated remaining durations.

B. Provide a Monthly Progress Status Report, which provides a narrative explanation of progress identified in the revised construction schedule. An electronic copy of each monthly schedule update is to be provided to the Construction Manager at the end of each month. The electronic copy is to be provided with no restrictions for viewing and analyzing using the same software with which the schedule was created. The monthly status report shall indicate the following items:

1. Summarize revisions made to the Construction Schedule since the previous submittal. Identify each task that has changed, what the change is, and the reason for the change.
2. Work completed during the reporting period.
3. A printed copy of the entire project schedule including the updated early and late dates, activity durations, predecessors and successors and a list of any logic and duration changes executed during the update period.
4. Work anticipated to be started during the next period, including those activities already in progress.
5. Problem areas, anticipated delays, and their impact on the schedule.
6. Corrective action recommended and its effect.
7. The effect of changes on schedules of other prime Contractors.
8. Updated Tabulation of Contract Time and a printed copy of the project critical path.
9. An evaluation of the overall status of the schedule for the job.

C. Application for Payment: Contractor understands and agrees that the submission and acceptance of progress updates and the receipt of progress reports are an integral part and basic element of the Applications for Payment; and that Contractor shall not be entitled to any progress payment under the Contract Documents until Contractor has fully complied with the requirements of this Section.

D. Review by the Construction Manager and Owner of Contractor’s Construction Schedule, or any revisions or updates thereto, are advisory only and shall not relieve Contractor of the responsibility for accomplishing each portion of the Work within each and every applicable Completion Date. Omissions and errors in the approved or accepted Construction Schedule, or any revisions or updates, shall not excuse performance which is not in compliance with the Contract Documents. Review by the Construction Manager does not make Owner, Architect, or Construction Manager liable to Contractor for time or cost overruns flowing from such omissions or errors.

3.5 RECOVERY SCHEDULES

A. Should the updated Construction Schedule, at any time during Contractor's performance, show, in the sole opinion of Construction Manager that any Contractor is ten (10) or more days behind schedule for any Completion Date, Contractor shall within seven (7) days after notice by Construction Manager, prepare a recovery schedule at no cost to Owner explaining and displaying how Contractor intends to reschedule his Work in order to regain compliance with the Construction Schedule during the immediate subsequent pay period. Contractor shall also coordinate schedule changes for implementation by General Contractor in overall schedule.

1. If Contractor believes that all of the time can be recovered during the subsequent pay period, Contractor shall be permitted to prepare a recovery schedule as set forth below. However, if Contractor believes it shall take more than thirty (30) days to recover all of the lost time, he shall prepare and submit a request for revision to the Construction Schedule and comply with all of the requirements of a schedule revision as set forth.
2. Contractor shall prepare and submit to the Construction Manager a limited duration recovery schedule, incorporating best available information from Subcontractors and others which shall permit return to Construction Schedule at the earliest possible time. Contractor shall prepare a recovery schedule to the same level of detail as the Construction Schedule for a maximum duration of one month. The recovery schedule shall be prepared in coordination with other Prime Contractors.
3. Within two (2) days after submission by the Contractor or by any Prime Contractor of a recovery schedule to Project Coordinator, Contractor shall participate in a conference with the Project Coordinator and Construction Manager to review and evaluate the recovery schedule. Within two (2) days of the conference, Contractor shall submit the revisions necessitated by the review for Project Coordinator's and Construction Manager’s review and acceptance. Contractor shall use the accepted recovery schedule as his plan for returning to the Construction Schedule.
4. Each Contractor shall confer continuously with the Project Coordinator to assess the effectiveness of the recovery schedule. As a result of this conference:

    a. If Construction Manager determines Contractor is still behind schedule, Project Coordinator shall direct Contractor to prepare a schedule revision with the assistance of the Project Coordinator and comply with all of the requirements of a schedule revision as stated herein and the other requirements of the Contract Documents; provided, however, that nothing herein shall limit in any way the rights and remedies of Owner and Project Coordinator as provided elsewhere in the Contract Documents; or
    b. If Project Coordinator determines Contractor has successfully complied with provisions of the recovery schedule, Project Coordinator shall direct Contractor to return to the use of the accepted Construction Schedule.

5. Nothing herein alters the obligation of Project Coordinator to resolve coordination and scheduling issues in dispute between and among Contractor and other Prime Contractors.

3.6 CAUSES FOR EXTENSIONS OF TIME

A. The Contract Times will be adjusted only for causes specified in this Contract. In the event any Contractor requests an extension of Contract Time, he shall furnish justification and supporting evidence per requests specified elsewhere in these Contract Documents. Each Contractor acknowledges and agrees that actual delays in activities, which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network, do not have any effect on the Contract Time, and therefore will not be the basis for a change in Contract Time.

B. Contract Time extensions for weather delays will be based only on the following criteria:

1. General Requirements: Even though a cause of delay meets any, or all, of the conditions stated herein, it shall in all cases be presumed that no extension, or further extension, of time is due unless Contractor shall demonstrate that the delay is justified and had an impact to the critical path of the updated CPM schedule for the delay period. To this end, Contractor shall maintain adequate records supporting any claim for an extension of time and shall submit such records, including a revised CPM schedule showing the impact of the delay, with the claim. Claims due to weather shall be submitted on a monthly basis and within five days after the end of the previous month of such delay.
2. The Owner will determine Contractor's entitlement to an extension of the Contract Time. Daily records, maintained by the Construction Manager, shall be the official source for weather data related to precipitation and temperature. A time extension of no more than one day will be granted for one day of lost work, regardless of the number of allowable reasons for lost time. The period of any extension of time shall be only for the portion of the contract actually delayed due to the abnormal weather conditions. Any extension of Contract Time allowed shall be considered non-compensable and have no impact on Contract Price.
3. Temperatures above or below the statistical mean are not considered to be justification for an extension of Contract Time.
4. Time extensions for snow shall be based on above normal snow for the project area and only based on direct impact to the CPM schedule. Only snow days with greater than 3" of snow cover will be considered in the request for time extension.

5. Time extensions for precipitation shall be based on above normal precipitation for the project area and only based on direct impact to CPM schedule. Only workdays with precipitation greater than one-tenth inch (0.10") shall be considered in the request for time extension.

3.7 ADJUSTMENT BY OWNER

A. From time to time it may be necessary for the Contract schedule and/or Contract Times to be adjusted by Owner due to the effects of job conditions, acts or omissions of other Contractors not directly associated with this contract, act of God, technical difficulties, unavoidable delays on the part of Owner or his representatives, and other unforeseeable conditions which may indicate schedule adjustments and/or an extension of the Contract Time. Under such conditions, Owner shall direct Contractor to reschedule the work to reflect the changed conditions, and Contractor shall revise his schedule accordingly. Only the Owner in writing shall grant schedule extensions affecting the Contract Time. No additional compensation shall be made to Contractor for such schedule changes except for unavoidable overall Contract delays, in which case Contractor shall take all possible action to minimize any time extension. It is specifically noted that available Project Total or Free Float in the CPM schedule may be used by the Owner and his representative to accommodate any adjustments in time, therefore eliminating the need for a time extension.

3.8 FLOAT TIME

A. Without obligation to extend the overall completion date or any intermediate completion dates set out in the CPM network, Owner may initiate changes to the Contract work that absorb float time. Owner-initiated changes that affect the critical path on the CPM network shall be the sole grounds for extending (or shortening) said completion dates. Contractor initiated changes that encroach on the total float time identified in the CPM network may be accomplished with Owner's concurrence. Such changes, however, shall give way to Owner-initiated changes competing for the same total float time.

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include the following:

1. Division 01 Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section 013100 "Project Management and Coordination" for submitting Coordination Drawings.
3. Division 01 Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Division 01 Section 013125 “Web Based Project Management System” for making shop drawing submissions.
5. Division 01 Section 014000 "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.
6. Division 01 Section 017700 "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.
7. Division 01 Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
8. Division 01 Section 019113 “General Commissioning Requirements” for additional information and procedures.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect’s responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that requires sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Division 01 Section 013200 "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to Architect before being returned to Contractor.
4. If intermediate submittal is necessary, process it in same manner as initial submittal.
5. Allow 15 days for processing each resubmittal.
6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.

f. Name and address of supplier.
g. Name of manufacturer.
h. Unique identifier, including revision number.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.

4. The Contractors shall utilize a 9+ character submittal identification numbering system in the following manner:

   a. The first six digits are to be the applicable Specification Section number.
   b. The next three digits shall be the numbers (001-999) to sequentially number each initial separate item submitted. The last character shall be a letter (A-Z) indicating the submission or resubmission version, i.e. "A"= initial submission, "B" = 2nd submission, "C" = 3rd submission, etc. A typical submittal number would be as follows:

      033000-008-B – (xxxx)

      033000 = Specification Section for Concrete
      008 = the eighth submittal under this specification section
      B = the second submission (first resubmission) of that particular shop drawing
      xxxx = Brief description of items in submittal

5. All submittals shall be clearly identified using the numbering system described above. Submittals items received without appropriate identification will be returned without review. The Contractor on the individual items to be reviewed and on the transmittal cover sheet under which the submittals are shipped shall provide the submittal number.

E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
3. Contractor shall provide two paper copies of all final submittals as directed by CM. Otherwise, all submittals shall be provided electronically.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor. Architect will return any submittal not submitted individually as rejected.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Provide locations on form for the following information:

    a. Project name.
    b. Date.
    c. Destination (To:).
    d. Source (From:).
    e. Names of subcontractor, manufacturer, and supplier.
    f. Category and type of submittal.
    g. Submittal purpose and description.
    h. Submittal and transmittal distribution record.
    i. Remarks.
    j. Signature of transmitter.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. No portion of the Work requiring shop drawings, samples or product data specified shall be started nor shall any material be fabricated or installed prior to approval of such item. Fabrication performed, materials purchased, or on-site construction accomplished which does not conform to approved shop drawings, submittals, or data shall be solely at the contractor risk and expense. The owner shall not be liable for any expenses or delay claims due to corrections or remedies required to accomplish conformity with this requirement.

J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:

a. Initial Submittal: Submit a preliminary single copy of each submittal where selection of options, color, pattern, texture, or similar characteristics is required. Architect will return submittal with options selected.
b. Final Submittal: Submit not less than 5 copies unless copies are required for operation and maintenance manuals. Submit additional copies where required for operation and maintenance manuals. Architect will retain 3 copies; plus at least one additional copy if reviewed by a consultant, the remainder will be returned. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operating and maintenance manuals.
k. Compliance with recognized trade association standards.
l. Compliance with recognized testing agency standards.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations.

j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.

2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

D. Coordination Drawings: Comply with requirements in Division 01 Section 013100 "Project Management and Coordination."

E. Electronic Submittals and Shop Drawings: All submittals and shop drawings may be submitted in electronic format through the project web-based management software. Specific requirements for reducing the quantity of paper copies will be reviewed at the pre-construction meeting.

1. Submit one copy electronically. Refer to Section 013125, Article 2.3, Paragraph A.1.
2. For Shop Drawings in format larger than 11 inches by 17 inches, Contractor shall provide one hard (printed) copy to the Architect along with the required electronic material.

F. Samples: Prepare physical units of materials or products, including the following:

1. Comply with requirements in Division 01 Section 014100 "Quality Requirements" for mockups.
2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:

a. Generic description of Sample.
b. Product name or name of manufacturer.
c. Sample source.

5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:

a. Size limitations.
b. Compliance with recognized standards.
c. Availability.
d. Delivery time.

6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

   a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of the variations.
   b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, and details of assembly, connections, operation, and similar construction characteristics.

7. Number of Samples for Initial Selection: Submit two full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

8. Number of Samples for Verification: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

   a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

9. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

G. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

   1. Type of product. Include unique identifier for each product.
   2. Number and name of room or space.
   3. Location within room or space.

H. Delegated-Design Submittal: Comply with requirements in Division 01 Section 014000 "Quality Requirements."

I. Contractor's Construction Schedule: Comply with requirements in Division 01 Section 013200 "Construction Progress Documentation" for Construction Manager 's action.

J. Submittals Schedule: Comply with requirements in Division 01 Section 013200 “Construction Progress Documentation."

K. Application for Payment: Comply with requirements in Division 01 Section 012900 "Payment Procedures."

L. Schedule of Values: Comply with requirements in Division 01 Section 012900 "Payment Procedures."

M. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

N. Steel Products Procurement Act: Submit certifications including, but not limited to, invoices, bills of lading, mill certifications, and other certification required to verify compliance with the Act.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. An officer shall sign certificates and certifications or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Division 01 Section 014000 "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements in Division 01 Section 013200 "Construction Progress Documentation."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names, and addresses of Architects and owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.

5. Description of product.
6. Test procedures and results.
7. Limitations of use.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section 017700 "Closeout Procedures."

P. Design Data: Prepare written and graphic information including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturers. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. REVIEW EACH SUBMITTAL AND CHECK FOR COMPLIANCE WITH THE CONTRACT DOCUMENTS. NOTE CORRECTIONS AND FIELD DIMENSIONS. MARK WITH APPROVAL STAMP BEFORE SUBMITTING TO ARCHITECT.

Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. GENERAL: ARCHITECT WILL NOT REVIEW SUBMITTALS THAT DO NOT BEAR CONTRACTOR'S APPROVAL STAMP AND WILL RETURN THEM AT THE CONTRACTORS EXPENSE WITHOUT ACTION.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

1. NO EXCEPTION TAKEN – This action is assigned when the information provided requires no additional notes or comments on the submittal and the information provided is in general conformance with the plans and specifications. The contractor may release the equipment or material for purchase or fabrication.
2. MAKE CORRECTIONS NOTED – This action is assigned when the information provided requires only minor notes or comments be added or corrections made to the submittal and the information provided is in general conformance with the plans and specifications. For clarification, this action may include additional comments from the architect indicating the extent of changes required.
3. REJECTED – This action indicates the information provided does not meet the intent of the design or is not specified on the drawings and/or specifications. Product substitutions made in this manner will be rejected. The contractor shall NOT release any equipment or material for purchase or fabrication. The Architect will return the contents of the submittal at the contractor's expense. The contractor shall resubmit the entire contents of the submittal.
4. SUBMIT SPECIFIED ITEM – This action assigned indicates that information is missing from the shop drawing submittal. The contractor should NOT release the equipment or material for purchase or fabrication.
5. REVISE AND RESUBMIT – This action indicates the information provided is incomplete or notes and comments are extensive enough to require a resubmittal of some or all of the information. This resubmittal is to address all comments, omissions, misrepresentations, and insufficient data that were received by the Architect. The contractor may, at their option, release the equipment or material for purchase or fabrication or resubmit the information requested for additional action. All notations and comments must be incorporated into the final product.

C. Informational Submittals: Architect will review each submittal and will not return it or will reject and return it if it does not comply with requirements.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded. The Architect is not required to notify the sender of such action.

3.3 ELECTRONIC DOCUMENTS

A. Architect and Construction Manager will make the drawings available to the Prime Contractor after the execution of the Owner-Contractor Agreement (**DOCUMENTS ARE NOT AVAILABLE DURING BIDDING**).

B. Files will be furnished in their original software format and are not available in any other format. The Architect does not guarantee software/hardware compatibility. The Contractor will be charged a handling fee of $100 plus $25.00 per drawing sheet, payable to the Architect, this cost is non-refundable.

C. The documents provided were prepared by Architect or their consultants as instruments of service to the Owner for this Project. The Owner and the Architect do not endorse or warrant the documents as suitable for any other purpose. These documents are furnished without warranties or guarantees (express, implied, or statutory), for the accuracy, reliability, and completeness. These files may vary from the documents used during bidding and do not include modifications issued by addenda or bulletins. If there are conflicts between the electronic drawings and the bid set, the bid set shall govern.

D. In order to obtain any documents in electronic format the Prime Contractor shall submit to the Architect a letter on company letterhead which includes the following information:

1. At this time, our company is requesting the following drawings in electronic format:

    a. (List each drawing by the sheet no. as it appears in the Contract Documents).

2. In making this request for documents in electronic format our company hereby agrees to the following conditions:

    a. We agree to remove any and all identification of the Architect and consultants from title block prior to the use of the documents.
    b. We agree to add our title block or the title block of our supplier prior to reproducing the documents either electronically or in printed form.
    c. We agree that prior to reproducing any drawing, we will verify the information and dimensions contained in the documents and assume the liability for the accuracy as if the drawings had been totally prepared by our own company.
    d. We agree that the use of these electronic files is specifically for this Project, these files will not be reproduced for any other project, and the Architect has not waived the Architect's copyright or other reserved rights.
    e. We agree to release and indemnify the Owner, Architect, and Construction Manager and their consultants against any losses or claims as a result of any errors or omissions in the electronic data.
    f. This letter shall be signed by person authorized to agree to the terms of the letter and shall be accompanied by a check to cover the charge per drawing

file listed above. Shipping and postage is not included in the amount stated above and will be an additional charge.

g. Electronic files are not construction documents. Differences may exist between the electronic files and corresponding hard-copy construction documents. The Architect and Owner make no representation regarding the accuracy or completeness of the electronic files. In the event that a conflict is discovered between the hard copy construction documents and the electronic files, hard-copy construction documents shall govern. The Contractor is responsible for determining if any conflict exists.

h. The use of the electronic files does not relieve the Contractor of fully complying with the Contract Documents or the need to check, confirm, and coordinate all dimensions and details, take field measurements, verify field conditions, and coordinate your work with that of other contractors for the Project.

i. Under no circumstances shall delivery of the electronic files be deemed a sale. The Owner and Architect make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use of these electronic files.

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SECTION 01 4000 - QUALITY REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Prime Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Prime Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Prime Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Prime Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Prime Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

D. Related Sections:

1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

2. Division 1 Section "Submittals" specifies requirements for development of a schedule of required tests and inspections.

3. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

C. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Prime Contractor or another entity engaged by Prime Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 RESPONSIBILITIES

A. Prime Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, each Prime Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services shall be included in the Contract Sum.
   1. Unless specifically noted the individual Sections, all inspections, tests, and other quality-control services are the Prime Contractor's responsibility, the Prime Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services shall be included in the Contract Sum.
   2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

B. Retesting: The Prime Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Prime Contractor's responsibility.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
   1. Provide access to the work
   2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4. Provide facilities for storage and curing of test samples.
   5. Deliver samples to testing laboratories.
   6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

7. Provide security and protection of samples and test equipment at the Project Site.

D. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1.6 INFORMATIONAL SUBMITTALS

A. Prime Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.

1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

B. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 REPORTS AND DOCUMENTS

A. The Prime Contractor's independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs

B. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Written reports of each inspection, test, or similar service include, but are not limited to, the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.

8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

C. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located
2. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
3. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

4. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

4. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
5. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

8. Registered Engineer Qualifications: A registered Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing Engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

9. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

   A. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

B. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Prime Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

   1. The agency shall notify the Architect and the Prime Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
   3. The agency shall not perform any duties of the Prime Contractor.

C. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

   1. Prime Contractor responsibilities include the following:

      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project

1.9 QUALITY CONTROL

A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 72 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work at the expense of the Contractor.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Prime Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 4000

SECTION 01 4200 – REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Prime Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A request or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated." Location is not limited.

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. “Installer": An installer is the Prime Contractor or another entity engaged by the Prime Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

J. The term "experienced," when used with an entity means having successfully completed a minimum of five previous projects similar in size and scope to this

Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
2. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Prime Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Prime Contractor.
    a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions

J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

K. “Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

L. “Addenda”: Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Drawings, and Specifications, by additions, deletions, clarifications, or corrections.

M. “Bid”: The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

N. “Bidder”: Any person, firm, or corporation submitting a Bid for the Work.

O. “Bonds”: Bid, Performance, and Payment Bonds and other instruments of surety, furnished by the Contractor and the Contractor’s surety in accordance with the Contract Documents.

P. “Change Order”: A written order to the Contractor authorizing an addition, deletion, or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

Q. “Contract Documents”: The contract, including Advertisement for Bids, Information for Bidders, Bid, Bid Bond, Agreement, Payment Bond, Performance Bond, Notice of Award, Notice to Proceed, Change Order, Drawings, Specifications, and Addenda.

R. “Contract Price”: The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

S. “Contract Time”: The number of calendar days stated in the Contract Documents for the completion of the Work.

T. “Contractor”: The person, firm, or corporation named as such in the Contract Documents.

U. “Drawings”: The parts of the Contract Documents which show the characteristics and scope of the Work to be performed and which have been prepared or approved by the Construction Manager.

V. “Engineer/Construction Manager”: The person, firm, or corporation named as such in the Contract Documents.

W. “Field Order”: A written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by the Construction Manager to the Contractor during construction.

X. “Notice of Award”: The written notice of the acceptance of the Bid from the Owner to the successful Bidder.

Y. “Notice to Proceed”: Written communications issued by the Owner to the Contractor authorizing him/her to proceed with the Work and establishing the date for commencement of the Work.

Z. “Owner”: A public or quasi-public body or authority, corporation, association, partnership, or an individual for whom the Work is to be performed.

AA. “Project”: The undertaking to be performed as provided in the Contract Documents.

BB. “Resident Project Representative”: The authorized representatives of the Owner who is assigned to the Project site of any part thereof.

CC. “Shop Drawings”: All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

DD. “Specifications”: A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

EE. “Subcontractor”: An individual, firm, or corporation having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

FF. “Substantial Completion”: The date certified by the Construction Manager when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purpose for which it is intended.

GG. “Supplemental General Conditions”: Modifications to General Conditions required by a Federal agency for participation in the Project and approved by the agency in writing prior to inclusion in the Contract Documents, or such requirements that may be imposed by applicable state laws.

HH. “Supplier”: Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

II. “Work”: All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the Project.

JJ. “Written Notice”: Any notice to any party of the Agreement relative to any 1 part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at their last given address or delivered in person to said party or their authorized representative on the Work.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

A. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

B. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities

indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.

APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	Association of the Wall and Ceiling Industry
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation)
CCC	Carpet Cushion Council

CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet and Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)

FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Part of GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation (Now BWF)
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.

ISO	International Organization for Standardization Available from ANSI
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA (Now ETL SEMCO)
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association

NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service

SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc. (Now TCNA)
TCNA	Tile Council of North America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.

UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.
UBC	Uniform Building Code (See ICC)

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy

EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Buildings Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board
CFR	Code of Federal Regulations Available from Government Printing Office
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)

FS Federal Specification
Available from Department of Defense Single Stock Point

Available from Defense Standardization Program

Available from General Services Administration

Available from National Institute of Building Sciences

FTMS Federal Test Method Standard
(See FS)

MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards
Available from Department of Defense Single Stock Point

UFAS Uniform Federal Accessibility Standards
Available from Access Board

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation

CCR California Code of Regulations

CPUC California Public Utilities Commission

TFS Texas Forest Service: Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 5000 - TEMPORARY FACILITIES & CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Sewer and Drainage
2. Water service and distribution.

3. Sanitary facilities including toilets, wash facilities, and drinking water facilities.
4. Temporary electric power and light.
5. Temporary heat, dehumidification and cooling facilities.
6. Telephone service

C. Support facilities include, but are not limited to, the following:
1. Field offices and storage sheds.
2. Temporary enclosures.
3. Hoists and temporary elevator use.
4. Temporary project identification signs and bulletin boards.
5. Waste disposal services.
6. Construction aids and miscellaneous services and facilities.
7. Temporary Stairs
8. Lifts and hoists
9. Dewatering facilities
10. Snow removal of construction site
11. Weed trimming and grass cutting of construction site

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Stormwater control.
3. Tree and plant protection.
4. Pest control.
5. Site enclosure fence.
6. Security enclosure and lockup.
7. Barricades, warning signs, and lights.

8. Temporary enclosures.
9. Temporary partitions.
10. Fire protection.
11. Site security lighting.
12. Temporary signage including pedestrian and traffic signage.
13. Temporary line striping and directional markings.

E. Related Sections include the following:

1. Section 011200 "Multiple Contract Summary".
2. Section 011400 "Work Restrictions" for use of Project premises, limits of use, and limitations on utility interruptions.
3. Section 008200, “Safety and Health Management Plan Project Requirements.”
4. Section 013300 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
5. Section 017300 "Execution" for progress cleaning requirements.
6. Section 017419 “Construction Waste Management” for additional information and procedures.
7. Section 018119, “Indoor Air Quality Requirements” for additional requirements.
8. Section 019113 “General Commissioning Requirements” for additional information and procedures.
9. Divisions 23 through 28 for temporary heat, ventilation, and humidity requirements for products in those Sections.
10. Division 32 Sections for construction and maintenance of asphalt paving and cement concrete pavement for temporary roads and paved areas.

1.3 DIVISION OF RESPONSIBILITIES

A. General: Each prime Contractor is assigned specific responsibilities for certain temporary services and facilities used by other prime Contractors, and other entities at the site. The Contractor for General Construction is responsible for providing temporary services and facilities that are not normal construction activities of other prime Contractors and are not specifically assigned otherwise. All contractors must review this entire Specification for temporary requirements in each Contract.

B. Each prime Contractor is responsible for:

1. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, as well as the costs and use charges associated with each facility.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office, complete with necessary furniture, utilities (including internal power distribution from external disconnect box and meters), and telephone service.
4. Its own storage and fabrication sheds.
5. All hoisting requirements including hoisting material or equipment outside the building enclosure.

6. Collection and disposal of its own hazardous, dangerous, unsanitary, or other harmful waste material.
7. Secure lockup of its own tools, materials, and equipment.
8. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
10. Generators for powering welders and other equipment with loads in excess of available power supply.
11. Progress cleaning and waste disposal of its own areas on a daily basis.
    a. Progress cleaning shall include removal of waste as a result of demolition, new installments and packaging associated with new installation.
12. Any specific water service and pressure needs necessary for its own construction activities.
13. Collection and disposal of fluid wastes, including any water containing effluents with or without solids until permanent sewer systems are functional and if permanent systems are equipped and/or permitted to accept such effluents.
14. Separation and disposal of solids prior to release into permanent sewer system.
15. Contractor's responsibility is to perform regular clean up and place construction debris in designated container. Refer to Waste Disposal and Clean Up, Article 3.4.D.
16. Contractor is responsible for management and disposal of all waste generated from all construction activities in accordance with the Construction Waste Management Plan (CWMP).
17. Each Prime Contractor is responsible for removal of their respective waste from new building construction, existing building demolition, sitework demolition and all site work related activities and shall follow procedures to direct as much waste as possible from the landfill.
18. Each Prime Contractor shall coordinate its Construction Waste Management Plan (CWMP) and disposal requirements with the other contractors.
19. Each Prime Contractor shall coordinate its CWMP and implementation to improve the efficient use of the construction staging areas.
20. Each Prime Contractor shall perform regular cleanup of construction waste to keep a clean and safe construction site. Construction Manager will re-assign clean up to other contractors and charge the contractor who is not performing the regular cleanup.
21. Waste disposal support as per Article 3.4D.

C. The Contractor for General Construction is responsible for but not limited to the following:
    14. Unpiped temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
    15. Unpiped sewers and drainage including drainage ditches, dry wells, stabilization ponds, and containers.
    16. Stormwater control
    17. Temporary separate field office for the Construction Manager (CM) and project meeting office.
    18. Project identification signs and temporary directional and safety signs.
    19. General waste disposal facilities.
    20. Temporary toilets, including disposable supplies.
    21. Temporary wash facilities, including disposable supplies.

22. Containerized bottled-water type drinking water units for the CM field office.
23. Temporary enclosure of the building.
24. Temporary partitions.
25. Temporary fire protection and temporary fire extinguishers.
26. Temporary heating, ventilation, and air conditioning (HVAC), and humidity control from the Notice to Proceed date to NINETY (90) days prior to scheduled Substantial Completion for all phases of the Project.
27. Rodent and pest control.
28. Temporary signage including pedestrian and traffic signageBarricades, warning signs, and lights.
29. Site enclosure fence including around Contractor parking and storage area.(Chain link fence)
30. Traffic controls
31. Covered walkways.
32. Security enclosure and lockup.
33. Environmental protection.
34. Maintenance and restoration of Owner's existing facilities used as temporary facilities including weekly and as needed street cleaning and sweeping as directed by CM.
35. Temporary water during construction
36. Coordination of Construction Waste Disposal for the Project for all contractors and facilities required to implement a Construction Waste Management Plan for the project in accordance with Section 017419 for all contractors.
37. Maintenance of all erosion and sediment controls per the erosion and sediment drawings. The County Conservation District has final decision in all related E&S requirements and maintenance needs.
38. Project identification, temporary signs and traffic controls.
39. Control and coordination of fire watch activities.
40. Protection of existing finishes to remain.
41. Snow removal and clearing of the site to provide access to all construction work areas, construction parking, and staging areas at all times.
42. Trimming and clearing of all weeds and grass cutting in the construction site to maintain a clean, organized site at all times.
43.
44. Temporary partitions compliant with Hospital-grade ICRA requirements. Maintain negative air pressure in the Construction Work Area.

C. The Plumbing Contractor is responsible for but not limited to:

1. Piped temporary water service distribution from the new water service when it is within 5 feet of building.
2. Temporary sewers and drainage.
3. Dewatering facilities and drains for all work that is Plumbing Contractors responsibilities and once permanent construction is installed (e.g. once permanent deck or waterproof decking is installed).
4. Temporary fire hoses and signs.
5. Security enclosure and lockup in coordination with the General Construction Prime Contractor.
6. Piped storm water from roof sections as schedule dictates.
7. Piped temporary toilet fixtures, wash facilities, and drinking water facilities.

8. Plumbing connections to existing systems and temporary facilities and controls furnished by the General Construction Contract, Plumbing Contract, Mechanical Contract, and Electrical Contract.

D. The Heating, Ventilating and Air-Conditioning (HVAC) Contractor is responsible for but not limited to:

1. Temporary gas service for heating requirements of HVAC Contractor only.
2. Permanent and/or temporary heating, ventilation and air conditioning (HVAC) from NINETY (90) days prior to Substantial Completion for each area until after Owner occupancy.
3. Security enclosure and lockup in coordination with General Prime Contractor.
4. Dewatering and drainage for Work under scope.

E. The Electrical Contractor is responsible for but not limited to:

1. Temporary electric power service and distribution. This includes office trailer services and distribution for each of the Prime Contractors and the Construction Manager. Coordinate temporary service requirements with the Construction Manager and the Energy Company.
2. Temporary lighting for building and site.
3. Power lines and outlets for temporary electric water coolers.
4. Connections for illuminated signs.
5. Temporary telephone lines and service to CM trailer.
6. Data and telecommunications conduit and wiring and service to CM trailer.
7. Security enclosure and lockup in coordination with the General Prime Contractor.
8. Dewatering and drainage for work under scope.
9. Electrical connections to existing systems and temporary facilities and controls furnished by the General Construction Contract, Plumbing Contract, Mechanical Contract and Electrical Contract.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner, Construction Manager, or Architect and shall be included in the total Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Owner’s construction forces.
2. Occupants of Project.
3. Architect and Construction Manager (CM)
4. Testing agencies.
5. Personnel of authorities having jurisdiction.

B. Water Service: Water from Owner's existing water system is available for use use if the contractor provides metering and pays for use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service: Electric power from Owner's existing system is available for use if the contractor provides metering and pays for use charges. Provide connections and extensions of services as required for construction operations..

D. Sewer Service Use Charges: The Owner shall pay sewer service use charges for sewer usage of the Owner's existing system by the Contractor engaged in construction, at the Project Site.

E. HVAC System:

10. General Contractor shall provide temporary HVAC systems and pay for all HVAC costs for all building areas from Notice to Proceed until NINETY (90) days prior to Substantial Completion.
11. HVAC Contractor is responsible for providing and operating the permanent HVAC system or any temporary HVAC system required for all building areas at all times from NINETY (90) days prior to Substantial Completion until after Owner occupancy. Utility costs for permanent HVAC system use will be paid by Owner. Utility costs for any approved temporary HVAC system provided by HVAC contractor in the ninety (90) day prior to Substantial Completion period shall be paid by the Owner provided that the temporary HVAC equipment is connected to the permanent HVAC system.
12. General Contractor is responsible to provide any supplemental HVAC equipment, including humidification and/or dehumidification equipment, that is necessary for the installation of new construction and finishes and maintaining equipment in place until Substantial Completion.
13. Owner will not be responsible for any costs for servicing, maintaining or operating temporary or permanent systems until after Substantial Completion of each phase.
14. HVAC Contractor must maintain, operate and extend equipment warranties as required to provide the Owner with a new, clean system with all warranty periods in effect as required by the Contract Documents.
15. HVAC Contractor shall provide a filter change after the date of Substantial Completion. Reference Section 018119, Indoor Air Quality Management for filter requirements.
16. HVAC Contractor shall comply with all the requirements of Article 3.2.G.
17. HVAC Contractor shall provide all necessary controls for safety requirements including smoke or fire monitoring, and with all necessary shutdown features to run and operate temporary or permanent HVAC systems.

1.5 SUBMITTALS

A. Temporary Utilities: Prime contractor shall submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of the date established for submittal of the Contractor's Construction Schedule, the prime contractor shall submit a schedule indicating implementation and termination of each temporary utility for which the Contractor is responsible.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

C. Shop Drawings and samples for verification: For temporary project identification sign, include the following information:

1. Sign design and details of construction.
2. Include dimensioned scale drawing indicating locations of text and size and location of graphic elements.
3. Font styles to be used, full size examples.
4. Color samples for each sign color indicated, not less than 3 inches square.

1.6 QUALITY ASSURANCE

A. Regulations: prime contractor shall comply with industry standards and with applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department and rescue squad rules.
5. Environmental protection regulations.

B. Standards: prime contractor shall comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
1. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Utilities: prime contractor shall prepare a schedule indicating dates for implementation and termination of each temporary utility for which the Contractor is responsible. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: The Installer of each permanent service shall assume responsibility for its operation, maintenance, and

protection during use as a construction facility prior to the Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Undamaged, previously used materials in serviceable condition may be used if approved by Construction Manager. Provide materials suitable for use intended.

B. Portable Chain-Link Fencing: The General Contractor shall provide temporary, post-driven galvanized steel chain link fence, 6’-0” high, 11-gauge wire in a 2” (50-mm) mesh with top and bottom selvages knuckled with movable supported ballast systems. At select locations where approved by CM, provide driven posts.

C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

D. Pavement and Concrete: Comply with requirements of Division 03 and 32 Sections.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

A. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry.

B. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

C. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary offices, shops, and sheds.

D. Paint: Comply with requirements of Division 9 Section "Painting."

1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applied graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
3. For interior walls of temporary offices, provide 2 coats interior latex-flat wall paint.

E. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

F. Water: Provide potable water approved by local health authorities.

G. Open-Mesh Fencing: Provide 0.12-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chainlink fabric fencing 6 feet (2 m) high galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts. Provide concrete bases for supporting posts.

1.2 TEMPORARY FACILITIES

A. General: Provide equipment suitable for use intended.

B. Field Offices:

1. Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air-conditioned; on foundations adequate for normal loading.
2. Each Prime Contractor shall provide an insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the Project site. Wood clad exteriors shall not be permitted.
3. Field Office for Construction Manager: The Contractor for General Construction shall provide, within one month of Notice to Proceed, a new or like-new insulated, weather-tight, prefabricated or mobile office units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide units with windows and lockable door on foundations adequate for office loading. Space shall include a 12’ x 60’ trailer with the following:

    a. An integrated washroom.
    b. Heating and cooling equipment appropriately sized for the space.
    c. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
    d. Two offices furnished with drawing table, work desk with storage drawers and rolling office chair, two (2) four-drawer filing cabinets and drawing rack.
    e. A room not less than 400 sq. ft. for project meetings furnished with a conference table, 15 folding chairs and a tackboard. This room will be dedicated for CM use and Project Meetings only.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.2 EQUIPMENT

A. General: The prime contractor shall provide new equipment. If acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4-inch (19-mm) heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

Generators: Provide generators sized to power equipment where temporary electric service is of insufficient capacity.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

G. Temporary HVAC Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
3. Temporary Dehumidifying Equipment: Provide system engineered by temporary equipment supplier for expected conditions and interior environment requirements specified. Provide self-contained, recirculating refrigeration units with water collection and filtration capabilities

    a. Equipment shall be sized with sufficient moisture extraction capabilities to maintain ambient interior air within specified relative humidity range.
    b. Provide collection and/or drainage capabilities to prevent condensate from re-evaporating in conditioned space or from spilling on floors.

H. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

J. Field Offices: Mobile units sized and equipped at the discretion of the Contractor. Units shall be kept clean, orderly and in good services.

1. Contractor shall equip and maintain its own field office with the following:

a. Telephone service with automated answering capabilities. Superintendents cellular phone service may serve this purpose.
b. Internal electrical distribution system terminating at an exterior mounted weatherproof heavy duty NEMA 3R disconnect.

K. Temporary partitions: Provide temporary partitions compliant with Hospital-grade ICRA requirements. Maintain negative air pressure in the Construction Work Area.

PART 3 - EXECUTION

TEMPORARY FACILITIES, GENERAL

Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials.

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.

C. Sewers and Drainage by General Contractor: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

D. Water Service:

1. General: Install water service and distribution piping in sizes and pressures adequate for construction.
2. General Contractor is responsible for all water needs on Project using water trucks until new water service is available at the building.

3. After new water service is available at the building, Plumbing Contractor shall provide the following:

    a. Water Service: Use of Owner's new water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to like-new condition.
    b. Provide rubber hoses as necessary to serve Project site.
    c. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
    d. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
    e. Provide a minimum of 30-psi (200-kPa) static pressure at highest point.

B. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear.

1. Install electric power service underground, except where overhead service must be used.
2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 V, ac 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
3. Extend service to locations that serve all Contractors and all project construction areas. Provide for up to 4 field office trailer connections.
4. Connect temporary service to Owner’s existing power source, as directed by electric company officials, or to temporary or new service as it becomes available.

    Contractor shall changeover from temporary to permanent at earliest feasible time and when acceptable to Owner. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

C. Temporary Lighting: When an overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
2. Provide one 100-w incandescent (or equivalent) lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
3. Provide one 100-w incandescent (or equivalent) lamp every 50 feet in traffic areas.

4. Provide one 100-w incandescent (or equivalent) lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
5. Install exterior site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

   At earliest feasible time, provide permanent lighting systems both inside the building and on the site for use in completing construction and lighting the project site. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

D. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

   1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.

E. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

   1. Provide separate facilities for male and female personnel.

F. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

   1. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.

G. Drinking-Water Facilities: The Contractor for General Construction shall provide containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

   1. Where power is accessible, the Electrical Contractor shall provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).

H. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

   1. Filter out excessive amounts of soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.

2. Connect temporary sewers to the municipal system as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

E. Electric Power Service by Electrical Contractor: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, and automatic ground-fault interrupters.

1. Install power distribution wiring overhead or underground and rise vertically where least exposed to damage.
2. Electric power service including all necessary poles and accessories shall be extended from off-site available sources after coordination with local electric utility company.
3. Provide adequate temporary electric service and for the following temporary field offices for light, power, heating and cooling located on the site:

   1 – General Contractor
   1 – Construction Manager*
   1 – HVAC Contractor
   1 – Plumbing Contractor
   1 – Electrical Contractor
   **Field office for Owner's testing agents: Testing personnel will share Construction Manager's trailer provided by General Contractor.*

4. Provide or extend the following temporary construction electric services to the various building areas within forty (40) days of Notice to Proceed unless noted otherwise:

   a. 120/208-volt, three phase, four-wire wye with a solid neutral service.
   b. Transformation and power distribution as shown as required for temporary needs specified unless noted otherwise on Construction Documents.
   c. Power receptacles distributed across the building as the Project develops. Minimum requirements for each building as follows:
      - Fifty (50) 120-volt receptacles.
      - Forty (40) 240-volt receptacles.
   d. Temporary power for trailers and construction area.
   e. Eighteen (18) temporary connections to HVAC temporary heating units when directed by CM.
   f. Five (5) site lights when directed by CM (see Article L below).

5. All extensions from the temporary power receptacles shall be provided by the parties requiring power.

F. Electric Power Service by Electrical Contractor:

1. Use of Owner's new electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

G. Electric Distribution by Electrical Contractor: Provide receptacle outlets adequate for connection of power tools and equipment in new building areas.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
4. Provide metal conduit enclosures or boxes for wiring devices.
5. Provide 4-gang outlets, spaced so 100-foot (30-m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
6. At earliest feasible time, but no later than 60 days prior to Substantial Completion of each Phase, provide permanent electric distribution systems. Provide 150A, 208V, 3-phase power distribution for temporary connections of terrazzo grinders during floor terrazzo floor installation. Provide power distribution at multiple locations as required to ensure the grinders can cover the entire terrazzo floor area using a 100’ cord. Power distribution may be provided from temporary source or permanent power distribution where available. Remove all temporary power distribution when it is no longer required.

H. Lighting by Electrical Contractor: Provide and maintain temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions. Wherever overhead floor or roof deck has been installed, the Electrical Contractor shall provide temporary lighting with local switching.

1. For New Construction:

a. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
b. Provide one 100-W incandescent lamp per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination.
c. Provide one 100-W incandescent lamp every 50 feet (15 m) in traffic areas.
d. Install exterior-yard site lighting that will provide adequate illumination for construction operations, security, traffic conditions, and signage visibility when the Work is being performed.
e. At earliest feasible time, but no later than 60 days prior to Substantial Completion of each Phase, provide permanent lighting systems both inside the building and on the site for use in completing construction and lighting the project site. Contractor must operate, maintain and protect the permanent systems through final completion of the project and provide full project warranty from the contract completion date of the project.

I. Chain Link Fence:

1. The General Contractor shall secure the site and furnish gates as shown on Phasing Plan(s) or as required for project and directed by Construction Manager. The fencing and gates shall be relocated and adjusted during the Project as

required, as noted on the Phasing Plans(s) and/or as directed by Construction Manager.

2. Temporary fence between the existing and operating building site and the construction area is to be installed as indicated on the Phasing Plans(s).

J. Temporary HVAC: The General Contractor shall provide temporary HVAC and humidity control required by construction activities, for curing or drying of completed installations, or protection of installed construction from adverse effects of low temperatures or high humidity from Notice to Proceed to NINETY (90) days prior to Substantial Completion for each new building area. Temporary HVAC and humidity control shall also be provided in all new building areas scheduled for work in order to maintain productivity of all trade contractors and personnel. Comply with the following:

1. Select safe equipment that will not have a harmful effect on completed installations or elements being installed.
2. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
3. Maintain the temporary heat to a minimum of 60 degrees F.
4. The General Contractor shall provide all other Prime Contractors with the Project Schedule and the minimum heating requirements to protect the Work as scheduled. If through no fault of any other Prime Contractor, the General Contractor does not maintain the original approved schedule, the General Contractor shall continue to provide temporary heat and humidity control to other Prime Contractors when required.
5. The General Contractor shall not be responsible for providing temporary heat and humidity control in permanently unconditioned areas or in areas not scheduled for work, unless the approved schedule is modified and accepted by the Owner and all Prime Contractors.
6. Prime Contractors are responsible to protect their work in unconditioned or unscheduled work areas at no additional expense to the Owner.
7. Prior to the permanent heating system being operational, and when necessary for the proper prosecution of the work, the General Contractor shall provide, maintain, operate and pay all costs including fuel, for sufficient approved heat.

K. Temporary/Existing/Permanent HVAC: The HVAC contractor shall provide HVAC from NINETY (90) days prior to Substantial Completion of each new building area and at all times for all building areas that are occupied or under construction and shall comply with the following:

1. When noted above, the HVAC contractor shall provide, maintain and operate sufficient temporary heating/cooling. If the new permanent heating or cooling system is used during this period, the HVAC contractor shall professionally clean all HVAC systems.
2. The HVAC Contractor shall properly protect all HVAC equipment / systems from construction air dust and debris beginning from initial installation.
3. Select safe equipment that will not have a harmful effect on completed installations or elements being installed.
4. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

5. Maintain the temporary heat to a minimum of 60 degrees F for construction areas and at 70 degrees F for all occupied areas.
6. At NINETY (90) days prior to Substantial Completion of new building areas, the Owner shall pay for fuel and electric energy used to operate the approved temporary or permanent heating or cooling and exhaust system provided that due care is exercised to avoid excessive use of fuel.
7. Portable heaters will not be acceptable during final finishing operations.
8. The new permanent heating and exhaust system or any portion thereof may be used by the HVAC Contractor to provide temporary heat and exhaust as required for the proper prosecution of the work as long as all the necessary protection and cleanup required by the Specifications and recommended by the manufacturer are strictly followed, and only when outside air is supplied directly to the burners. The HVAC Contractor shall, when operating the permanent system complete all required servicing and adjusting to maintain the system in proper running order to prevent damage to the building or its equipment during the construction period. Units placed in permanent operation must be fully controlled using the final control system operational sequence.
9. When the HVAC Contractor performs startup and begins using the permanent HVAC systems, the Contractor must provide pre-filters, return air filters, plenum filters and or other modifications to the systems necessary to prevent dirt, dust and other contaminants from entering the system. If measures implemented do not prevent dust from entering the systems, the HVAC Contractor shall perform cleaning of duct, coil and other HVAC components necessary to provide clean HVAC systems at Substantial Completion of the Project.
10. Prior to turning over the new permanent heating and ventilating system to the Owner, the HVAC Contractor shall thoroughly clean the system, provide new filters, make re-adjustments as required and bear all cost to place the system in first-class operating condition. Contractor shall follow all requirements for cleaning and media as provided in Section 018119, Indoor Air Quality Management.
11. The warranty period of individual pieces of equipment of the permanent system used during the construction period shall be extended during the temporary use period and the starting date used for determination of expiration for such warranties shall begin upon final acceptance of the project by the Owner.
12. Work which is damaged as a result of improper or insufficient climate control shall be removed and replaced.

L. Ventilation and Humidity Control by General Contractor:

1. Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
2. Temporary Humidity Control:

    a. General: Where control of ambient humidity is required for proper performance of the work, or for curing/drying of installed work, or for protection of installed work from deterioration due to variations in ambient conditions and/or adverse effects of high humidity, the General Contractor

shall provide temporary humidification or dehumidification equipment to maintain the required conditions. This equipment may require air conditioning to achieve the desired results and maintain the Project schedule. Determination of the required equipment is the responsibility of the General Contractor. Coordinate the use of the equipment with temporary heating to produce the required conditions with a minimum overall use of energy.

b. Construction Dehumidification (ongoing): The General Contractor shall provide portable dehumidification units for use during construction. Units shall be provided as required to maintain optimal building moisture conditions required for the proper performance of the Work. Moisture levels shall be maintained throughout both occupied and unoccupied areas of the facilities.

c. Units shall be refrigeration-based and shall include standard 115V power cord, humidistat, integral condensate pump, wheels and handle. Units shall be as manufactured by Ebac or approved equal. Dehumidifier capacities and quantities shall be as follows:

   i. Quantity 15 - Minimum 25 gallons/day capacity (Ebac BD150CR or equal).
   ii. Locations shall be as agreed upon in the field with the Architect and Construction Manager.

d. General Contractor shall furnish and install drainage hoses and connections to discharge condensate to exterior of building at locations acceptable to the Construction Manager and Architect.

e. The Electrical Contractor shall be responsible to distribute power sources throughout each area of the building dedicated for the purpose of power for the humidification and/or dehumidification units. This power shall be in addition to power required by the trades for performance of their Work.

3.3 SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet (9 m) of building lines. Comply with requirements of NFPA 241.

3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will not be permitted to use permanent facilities.

C. Temporary Site Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

D. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

M. Project Identification and Temporary Signs by General Contractor:

1. Prepare and install one 4’ x 8’ Project identification sign as indicated on the drawings and/or as directed by Construction Manager and Architect. Do not permit installation of unauthorized signs.
2. Prepare and install up to 12 signs 4’ x 3’ with information to direct and control traffic on site and in building. Apply graphics and text as directed by Construction Manager. Install where directed.
3. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details provided by the Architect.
4. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
5. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer. Architect will provide digital file for graphic. Adhere custom vinyl graphic after paint has cured. Edge seal vinyl graphic using a fine-tip brush, painting the edges of the film with a commercial grade edge sealer.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

N. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

O. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

P. Stormwater Control: Provide silt barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

Q. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

R. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.

1. Set fence posts below grade a minimum of 3 feet.
2. Provide gate in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
3. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide CM and Owner with one set of keys and/or access code(s).
4. Provide plywood on fencing adjacent to existing windows and doors.

S. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Lock entrances at end of each workday.

T. Site Security: Ensure all windows, doors and gates are closed and secured at the conclusion of each day in scheduled work areas.

U. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.
2. Where indicated on phasing plan provide concrete ‘Jersey’ barriers.

V. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
6. Provide temporary enclosures as required to meet criteria for permanent enclosure no later than the beginning of any of the following Work:

    a. Spray fireproofing.

b. Interior finishes, including gypsum wallboard finishing, painting and wall coverings.
c. Architectural woodwork.
d. Institutional casework.
e. Install temporary enclosures before time frames stated above when necessary to maintain interior relative humidity levels and temperatures as required to promote drying of concrete and concrete masonry substrates so that they achieve low enough moisture content and vapor emission levels to permit timely installation of finishes.

W. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construction dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire retardant plywood on construction side.
2. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, 2 layers of 3-mil polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch fire-retardant plywood.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weatherstrip openings.

X. Exterior Surface Protection:

1. Where sequence of operations exposes exterior finished materials including, but not limited to factory finished metal, anodized metal, glass and the like, to mortars, grouts, alkalis, acids, strong detergents or other materials that may cause damage to adjacent finishes, provide surface protection materials completely over surface to be protected.
2. Comply with surface protection material manufacturer’s recommendations. Do not leave materials in place beyond maximum time limit.
3. Remove protection materials completely when at-risk work is complete.

Y. Traffic Surface Protection:

1. New Finished Traffic Surfaces: From the time of installation to just before inspection for Substantial Completion, overlay traffic surfaces with traffic protection products as recommended by manufacturer for substrates to be protected. Replace traffic protection products when damaged. Where specified products do not meet construction traffic demands or when required by Architect or Construction Manager, provide more substantial protection as specified below for existing traffic surfaces to remain.
2. Existing Finished Traffic Surfaces to Remain: From the time of one week before the commencement of any work of a phase of any prime contractor in area or areas immediately adjacent to floors to be protected, overlay traffic surfaces with one layer of craft paper and follow with one layer of plywood. Secure plywood

with heavy adhesive tape. Maintain protection for duration of work in area and remove just before inspection for Substantial Completion.

Z. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
2. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
3. Provide temporary standpipes and hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
4. Prohibit smoking and vaping in construction areas.
5. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
6. Coordinate activities with Fire Watch. Notify Fire Watch of hours of operation and planned fire-risk activities such as welding within construction areas.

AA. Fire Watch: Provide adequate number of and properly trained personnel to provide fire watch in accordance with NFPA 51B “Standard for Fire Protection During Welding, Cutting and Other Hot Work 1999 Edition, NFPA 101 “Life Safety Code”, Articles 9.6.1.8 and 9.7.6.1 (including appendix) and as follows:

1. Fire Watch personnel shall be trained and provide services in compliance with NFPA 601 “Standard for Security Services in Fire Loss Prevention” and shall be acceptable to the Authorities Having Jurisdiction.
2. The responsible party for Fire Watch Services as defined in Division 01 Section “Multiple Contracts Summary” shall be considered “Management” for the purposes of complying with the referenced standards.
3. Fire Watch personnel shall be provided with portable communications to permit immediate communication with school authorities, contractors and public emergency services.
4. Conduct a coordination meeting in advance of the earliest requirement for Fire Watch with the Owner, respective Project Coordinators, Construction Manager, Authorities Having Jurisdiction and Architect.

    a. Develop an emergency response plan for risks associated with construction. Coordinate with Owner’s existing security and emergency response plan.
    b. Establish the lines of and order of communications based on each anticipated risk type.
    c. Project Coordinators shall record and transmit minutes of the meeting to attendees and to Fire Watch personnel.

5. Fire Watch shall be provided at the Work by respective responsible entity as defined in Division 01 Section “Multiple Contract Summary.”

    a. When hot work is being conducted.
    b. When fire alarm is not in operation in occupied areas for time greater than 4 hours.
    c. When fire suppression system is not in operation in occupied areas for time greater than 4 hours.

6. For the entire duration of time from the blocking of existing stair towers.
7. For the entire duration of time from the disturbance of the egress route.

a. N. Fire Extinguishers: Class A stored-pressure water-type extinguishers. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking/vaping on the Project site and within all building areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

O. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection in facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

3.5 OPERATION, TERMINATION, AND REMOVAL

BB. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

CC. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

DD. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

EE. Temporary Facility Changeover for Security and Protection: Except for using permanent fire protection as soon as available, do not change over from using

temporary security and protection facilities to permanent facilities until Substantial Completion.

FF. Termination, Removal and Temporary Facility Changeover: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns and dispose of in a legal manner. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Section 017700 "Closeout Procedures."
4. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
5. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

1.3 NO SMOKING

A. Smoking, vaping, or use of any tobacco product will not be permitted on the entire Project site.

1.4 IDENTIFICATION SIGNS

A. Only one project sign will be permitted for the site, provided by the General Contractor and listing all contractors. Individual contractor signs will not be permitted.

1.5 COMPLIANCE WITH TEMPORARY FACILITIES AND CONTROLS

A. If contractor does not comply with any of the requirements of this Section, CM reserves the right to recommend to Owner to withhold adequate funds from payment applications to pay for completing the Work as required.

END OF SECTION 01 5000

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SECTION 01 6000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Prime Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 01 Section "Submittal Procedures" specifies requirements for submittal of the Prime Contractor's Construction Schedule and the Submittal Schedule.
3. Division 01 Section "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

b. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

c. Comparable Product: Product that is demonstrated and approved through substitution process, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

2. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Bidder.
3. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

4. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

5. Special Warranty: Written warranty required by or incorporated into the Contract Documents, to extend time limit provided either by manufacturer's warranty or to provide more rights for Owner.

    a. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

6. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
7. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Product List: Prepare a list showing products specified in tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.

1. Coordinate product list with the Prime Contractor's Construction Schedule and the Schedule of Submittals.
2. Form: Prepare product list with information on each item tabulated under the following column headings:

    a. Related Specification Section number and title.
    b. Generic name used in Contract Documents.
    c. Proprietary name, model number, and similar designations.

d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.

h. Identificaiton of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.

   a. At the Prime Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.

5. Architect's Action: The Architect will respond in writing to Prime Contractor within 2 weeks of receipt of the completed product list. No response within this period constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable product selections, containing a brief explanation of reasons for this action.

6. Pre-bid Substitution Requests: Submit one copy of each Pre-bid Substitution Request not later than 10 days prior to receipt of Bids for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   a. Substitution Request Form: Refer to Specification Section 002625, Substitution Request Form.
   b. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      1) Statement indicating why specified material or product cannot be provided.
      2) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      3) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
      4) Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      5) Samples, where applicable or requested.

6) List of similar installations for completed projects with project names and addresses and names and addresses of Architects and owners.
7) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
8) Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
9) Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
10) Cost information, including a proposal of change, if any, in the Contract Sum.
11) Bidder’s certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
12) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

c. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

1) Form of Acceptance: Addendum.
2) Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated from the information provided it will be rejected.

7. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has

been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Prime Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each Prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate contractors.
2. If a dispute arises between Prime Contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must be replaced.

a. The material selected by the Architect shall be provided at no additional cost to the Owner.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
   Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions. Deliveries addressed to the project, in general, the Owner, Architect/Engineer, or Construction Manager, will be refused and returned to shipper.

2. Notify Construction Manager and Owner 48 hours in advance of major deliveries.

3. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
4. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
5. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
6. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
7. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
8. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
9. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

a. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
b. Protect stored products from damage.

10. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

B. PRODUCT WARRANTIES

1. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

2. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

a. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
b. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
c. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

3. Submittal Time: Comply with requirements in Division 01 Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

a. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
b. Where products are accompanied by the term "as selected," Architect will make selection.
c. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
d. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
e. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

a. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
b. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
c. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

d. Where products are accompanied by the term "as selected," Architect will make selection.
e. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
f. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
g. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

2. Product Selection Procedures: Procedures for product selection include the following:

a. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
b. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
c. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that comply with requirements.
d. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
e. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
f. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
g. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
h. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product(s)" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
i. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with

requirements and matches Architect's sample. Architect's and Owner's decision will be final on whether a proposed product matches satisfactorily.

1) If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

j. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

1) Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect and Owner will select color, pattern, or texture from manufacturer's product line that does not include premium items.

C. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect and Owner will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.COLOR SELECTION

1. Pre-Selected Colors:

a. Where colors have been specifically identified in the Contract Documents, the products provided by the Contractor shall match the selected color to the satisfaction of the Architect or the product will be rejected as non-conforming materials.
b. Manufacturers listed in the specification sections are capable of manufacturing the product specified but may not manufacture the specific selected color identified in the Contract Documents as part of their running line.

2. If additional up-charges are associated with providing the colors identified in the Contract Documents, the Contractor shall be responsible for all such costs and no additional cost to the Owner above the Contract Sum will be considered.

3. Colors Selected During Construction:

a. Products will be selected by the Architect from the standard colors of any of the listed or approved manufacturers, unless a specific color or color price range has been identified prior to bidding.

4. Location of Selected Colors: In general, preselected colors are identified in the following locations:

a. Exposed Interior Finishes: Room Finish Schedule - Color Legend.
b. Other Materials: Individual Specification Sections or notes to the Drawings.

D. SUBSTITUTIONS AFTER EXECUTION OF THE AGREEMENT

1. Substitution of Materials: No substitutions of materials will be considered after the Execution of the Contract without a Credit to the Owner unless a Product becomes unavailable through no fault of the Contractor.

2. NO ACTION TO REVIEW THE PROPOSED SUBSTITUTION WILL BE TAKEN BY THE ARCHITECT OR ENGINEER UNTIL THE CONTRACTOR HAS SUBMITTED THE FOLLOWING:

   a. A letter itemizing the proposed credit to Owner.
   b. A copy of the warranty.
   c. A summary of the schedule impact.
   d. Properly executed Document 002625, Substitution Request Form.

3. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request as included above, or when acceptance will require revision to the Contract Documents.

4. In submitting a substitution request the Contractor acknowledges that:

   a. The Contractor shall coordinate installation of the substitution including modifications to other Work.
   b. The use of this Substitution will not adversely affect the Project Schedule.
   c. If modifications to the work of this contract or another contract are required because of the substitution these modifications shall be made at no additional cost to Owner.
   d. The Contractor waives all rights to claims for additional costs or time extension which may subsequently become apparent.

E. COMPARABLE PRODUCTS

1. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

   a. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents, and will produce the indicated results, and that it is compatible with other portions of the Work.
   b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   c. Evidence that proposed product provides specified warranty.
   d. List of similar installations for completed projects with project names and addresses and names and addresses of Architects and Owners, if requested.
   e. Samples, if requested.

2.5 USE OF NON-HAZARDOUS MATERIALS:

A. Materials used in this Project shall have no detectable levels of the following hazardous materials.

1. Asbestos of any form or type.
2. Lead in water supply line solder.
3. Lead in paint coatings and finishes.
4. Polychlorinated Biphenyls (PCBs).

B. Upon substantial completion, the Contractor shall submit, on its company letterhead, a signed statement certifying that the products supplied under its Contract had no detectable levels of the hazardous materials listed above in Paragraph 2.5.A. Final payment will not become due until five (5) copies of this letter are submitted (one each for the CM and Architect's files and three for Owner).

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 6000

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SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

A. Drawings and general provisions of Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:
1. Division 01 Sections "Summary" for limits on use of Project site.Division 01 Section “Closeout Procedures” for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water-service piping, and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

    a. Description of the Work.
    b. List of detrimental conditions, including substrates.
    c. List of unacceptable installation tolerances.
    d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than 30 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner’s written permission.
   All utility interruptions shall be scheduled for weekends or holidays.

D. Revise "Review of Contract Documents and Field Conditions" Paragraph below to suit Project and Owner's special requirements.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions

outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

1. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
2. Inform installers of lines and levels to which they must comply.
3. Check the location, level and plumb, of every major element as the Work progresses.
4. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

B. The layout of all major items must be done by a PA Licensed Land Surveyor.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

A. Each prime contractor is responsible to comply with progress cleaning. The General Contractor shall be responsible for overall progress cleaning. If in the opinion of the Construction Manager, any contractor fails to comply with progress cleaning, and upon written request by the Construction Manager to the affected contractor, the Construction Manager shall direct the Architect to prepare a deduct change order. The Owner also reserves the right to perform progress cleaning and deduct the cost from the contractor or contractors responsible. If multiple contractors are at fault, the costs may be apportioned solely in the judgment of the Construction Manager. The amount deducted shall be a minimum of $200.00 per day. Construction Manager may also withhold processing of contractor’s payment until cleanup duties are resumed to Construction Manager’s satisfaction.

B. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

C. Site: Maintain Project site free of waste materials and debris.

D. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

E. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

F. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

G. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

H. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

I. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

J. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

K. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

L. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 "Quality Requirements"

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. When finished work is installed, such as, but not limited to, flooring materials, toilet fixtures, roofing, doors, casework, countertops, finished wall surfaces or other materials that can be damaged during construction, provide appropriate protection immediately after installation to prevent damage.

B. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

D. Contractors shall not use finished materials and surfaces as ladders, platforms or storage shelves. Tools and toolboxes shall not be placed on finished surfaces without adequate protection.

E. Construction Manager can deduct $200.00 per day from any contractor not properly protecting their finished work or from any contractor working on, above or adjacent to finished work and not properly protecting such work.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section 017329 "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 01 7300

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SECTION 01 7329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Field verify existing conditions prior to proceeding with the work - Notify the Architect in writing of any conditions that are significantly different from those indicated on the drawings. Adjust work in accordance with the Architect's instructions.

B. This Section includes administrative and procedural requirements for cutting and patching.

C. Requirements and limitations for cutting and patching of Work.

a. A Contractor, subcontractor, or sub-subcontractor requiring the cutting of openings in new Work installed by others shall have such openings cut and patched by the trade which installed the work, and such cutting and patching shall be at the expense of the Contractor, subcontractor, or sub-subcontractor requiring the opening.
b. A Contractor, subcontractor, or sub-subcontractor requiring the cutting of openings or patching of existing materials shall be performed by a sub-contractor with experience in cutting and patching of material being modified and shall be at the expense of the Contractor, subcontractor, or sub-subcontractor requiring the opening.
c. Approval to do such cutting and patching shall be received from the Architect prior to proceeding with the work and shall include installation of such reinforcement of the work as the Architect may direct.
d. All blocking, bracing, reinforcement, or structural enhancement required due to cutting and patching shall be provided at no additional cost to Owner. All patching work shall match adjacent existing Work unless otherwise noted.

1. Related Sections include the following:

a. Division 01 Section 017300 "Execution" for additional general administrative and procedural requirements governing execution of the Work.
b. Divisions 02 through 31 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 Sections for other requirements

and limitations applicable to cutting and patching mechanical and electrical installations.

C. DEFINITIONS

A. Cutting: Removal of existing or in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

D. PREINSTALLATION MEETINGS

1. Cutting and Patching Conferences: Prior to commencing Work requiring cutting and patching, meet at Project site with parties involved in cutting and patching to review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching Work. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each Prime Contract directly concerned or affected by the cutting and patching to attend, including the following:

    1) Contractor's superintendent.
    2) Trade supervisor responsible for cutting operations.
    3) Trade supervisor(s) responsible for patching of each type of substrate.
    4) Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

    1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
    2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
    3. List products to be used and firms or entities that will perform Work.
    4. Indicate dates when cutting and patching will be performed.
    5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
    6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction.
b. Bearing and retaining walls.
c. Structural concrete.
d. Structural steel.
e. Lintels.
f. Structural decking.
g. Miscellaneous structural metals.
h. Exterior curtain-wall construction.
i. Equipment supports.
j. Piping, ductwork, vessels, and equipment.
k. Structural systems of special construction in Division 13 Sections.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Primary operational systems and equipment.
b. Air or smoke barriers.
c. Water, moisture, or vapor barriers.
d. Membranes and flashings.
e. Fire protection systems.
f. Noise and vibration control elements and systems.
g. Control systems.
h. Communication systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction in Division 13 Sections.

2. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.

c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1. If possible retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.

a. Processed concrete finishes.
b. Matched-veneer woodwork.
c. Preformed metal panels.
d. Firestopping.
e. Window wall system.
f. Stucco and ornamental plaster.
g. Acoustical ceilings.
h.
i. Fluid-applied flooring.
j. Carpeting.
k. Aggregate wall coating.
l. Wall covering.
m. HVAC enclosures, cabinets, or covers.

1.5 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

1. General: Comply with requirements specified in other Sections of these Specifications.

2. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

a. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials. Use materials that are not considered hazardous.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

2. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

1. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

1) Clean piping, conduit, and similar features before applying paint or other finishing materials.
2) Restore damaged pipe covering to its original condition.

3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.

b. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
c. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Each Prime Contractor shall do cutting and patching in existing work or work already constructed required for the work involved in their Contract. Patch holes or openings left by him to match the unaltered existing construction:

1. In Work already constructed, lintels and structural supports required to maintain structural integrity shall be provided by the Contractor whose work requires the opening.
2. Cutting of holes, installation of curbs, and temporary, weatherproof, and secured enclosures for penetrations through the existing Work shall be the responsibility of the Prime Contractor whose work requires the penetration. Actual roof flashing and associated work must be executed by a subcontractor, hired by the Prime Contractor, who is acceptable to the manufacturer of the existing roof

which shall be certified, in writing, to the Owner and Architect/Engineer by the manufacturer. Existing warranty/guarantee shall be certified as remaining valid.

3. For penetrations through new work, the Prime Contractor whose work requires the penetration shall be responsible to provide the General Contractor of location, size, and configuration required for the penetration well in advance of the scheduled work. Prime Contractor who requires penetrations through the new roof construction shall provide the prefabricated roof curb and temporary, weatherproof, and secured enclosure on top of curb.

E. Each Prime Contractor shall employ skilled and experienced installer to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

F. Each Prime Contractor shall submit written request in advance of cutting or altering elements affecting:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

G. Should conditions of work or the schedule indicate a change of products from original installation, each Prime Contractor shall submit request for substitution as specified in Section 016000 “Product Requirements”.

1. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
2. After uncovering work, inspect conditions affecting installation of products or performance of work.
3. Report unsatisfactory or questionable conditions to Construction Manager and Architect/Engineer, in writing; do not proceed with Work until Architect/Engineer has provided further instructions.

H. Each Prime Contractor shall submit written notice to Construction Manager designating the date and time the work will be uncovered.

1. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
2. Provide devices and methods to protect other portions of project from damage.
3. Provide protection from elements for that portion of the project exposed by cutting and patching work and maintain excavations free from water.

I. Each Prime Contractor shall execute cutting, fitting, and patching including excavation and fill, to complete Work and to:

1. Make its several parts fit together properly.
2. Uncover portions of the work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of the Contract Documents.
5. Remove samples of installed work as specified for testing.

6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

J. Each Prime Contractor shall execute Work by avoiding damage to other work and providing proper surfaces to receive patching and finishing.

K. Each Prime Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

L. Each Prime Contractor shall restore Work with new products in accord with requirements of Contract Documents.

M. Each Prime Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

N. Each Prime Contractor shall maintain integrity of wall, ceiling, or floor construction, and completely seal voids.

O. Each Prime Contractor shall refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

P. Each Prime Contractor shall identify hazardous substance or condition exposed during the Work to the Construction Manager for decision or remedy.

D. MISCELLANEOUS PROVISIONS

1. Lead-Based Paint:

1. Lead-Based Paint Disturbance: Each Prime Contractor shall be responsible for lead-based paint disturbance precautions. Painted and varnished surfaces must be assumed to be coated with lead-based paint. When these surfaces are disturbed, that disturbance shall be conducted in accord with the Environmental Protection Agency (EPA) 40 CFR, Part 745 “Lead, Renovation, Repair and Painting Program”. Compliance to include using EPA licenses and certified trained renovators, Owner and occupant notifications, work area containment, dust minimization, and clean-up certification. Architect/Engineer shall be copied on the Owner and occupant notifications.

2. Lead-Based Paint: Demolition and Handling

a. Contractor shall handle, contain, store, test, transport, and dispose of demolition debris with lead-containing surface coating in accordance with applicable local, state, and federal regulations. Most painted architectural components in fair condition (not blistering, peeling, etc.), by law, may be disposed of as Construction and Demolition (C&D) debris. If deemed necessary for disposal, Contractor shall be responsible for collecting and having analyzed representative samples of the waste. If necessary, samples shall be tested for toxicity using the Toxicity Characteristics Leaching Procedure (TCLP) for lead sufficient to determine whether the debris is a hazardous waste as defined in 40 CFR 261.3, or a residual

waste, as defined in 25 PA Code 287.1, and shall include such analysis as required by the disposal facility. A qualified environmental laboratory acceptable to the Architect and Construction Manager shall conduct tests. A copy of all testing shall be forwarded to the Architect, Construction Manager and Owner.

b. The Contractor shall be responsible for the costs of sample collection and laboratory analysis. Alternately, Contractor can assume lead waste generated is a hazardous waste and TCLP testing is not required, but the waste must then be disposed of and transported as hazardous waste.

c. If, based on testing, there is any hazardous waste generated and transferred to a hazardous waste disposal facility, Contractor shall provide, within 45 days from the time the material is transferred to the disposal facility, a waste manifest to the Owner that identifies the disposal facility name and address, EPA Identification Number, the identity of the waste material, and a statement certifying that the waste was disposed at that facility, including the date. Forward original document to Owner with a copy to the Architect and Construction Manager. Contractor shall be responsible for any and all costs related to the lead-based paint items noted above.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01 7329

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 011200 “Multiple Contract Summary” for coordination of responsibilities for waste management.
2. Section 024116 “Structure Demolition” for disposition of waste resulting from demolition of buildings, structures, and site improvements.
3. Division 04 Section "Unit Masonry Assemblies" for disposal requirements for masonry waste.
4. Division 31 Section “Site Clearing” for disposition of waste resulting from site clearing and removal of above-and below-grade improvements.

C. Sample Construction Waste Management (CWM) forms, referenced in this Section, are included as Section 017419A.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent legal sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: General Contractor shall submit plan for all work associated building construction and renovation within fifteen (15) days of date established for Notice to Proceed.

B. **For All Construction**: Each Prime Contractor shall provide sufficiently detailed waste management information for its Work as needed by the by the General Contractor for a waste management plan. The General Contractor shall develop and implement a Construction Waste Management Plan for all Work for the **entire Project**, quantifying by weight, the percentage of waste materials diverted from landfill disposal. **All Contractors and Subcontractors are required to pay for and dispose of all their construction waste in accordance with the CWMP and its provisions throughout all Project activities. Each Prime Contractor shall coordinate dumpster locations with the General Contractor.**

C. Sitework Sub/Contractor will be responsible for all construction waste generated by its activities and will comply with Paragraph 1.3A as it relates to sitework demolition and waste.

1.5 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Each Contractor shall submit monthly waste management reports to the General Contractor. Each month, the General Contractor shall compile the data from all Contractors and with each Application for Payment, submit report.

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator and refrigerant recovery technician.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered. All refrigerant recovery activities will be the responsibility of the Mechanical Contractor.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: General Contractor and Construction Manager shall conduct conference at Project site with all Contractors to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Each Contractor shall provide sufficiently detailed waste management information for its Work as needed by the General Contractor for a waste management plan according to the requirements in this Section. Plan shall include waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition, construction, and site waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

1. GC is to compile the waste management plan information of all Contractors into one plan, and remit plan information as noted in Article 1.4. General Contractor shall monitor the construction waste management operations of each Contractor and issue notices, with copies to Construction Manager and Architect, as necessary to enforce the approved plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS AND RESPONSIBILITIES

General: Achieve maximum end-of-Project rates for salvage/recycling of non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials**, including but not limited to the following:**

1. Demolition Waste:

a. Asphalt paving
b. Concrete
c. Concrete reinforcing steel
d. Concrete masonry units
e. Bricks
f. Roofing
g. Cast stone
h. Limestone
i. Wood studs
j. Wood flooring
k. Wood joists
l. Other wood materials
m. Structural and miscellaneous steel
n. Rough hardware
o. Insulation
p. Doors and frames
q. Door hardware
r. Windows
s. Glazing
t. Metal studs
u. Gypsum board
v. Acoustical tile and panels
w. Carpet and carpet pad
x. Demountable partitions
y. Equipment
z. Cabinets
aa. Plumbing fixtures
bb. Piping
cc. Supports and hangers
dd. Valves
ee. Sprinklers
ff. Mechanical equipment
gg. Refrigerants
hh. Electrical conduit
ii. Copper wiring
jj. Lighting fixtures
kk. Lamps
ll. Ballasts
mm. Electrical devices
nn. Switchgear and panelboards
oo. Transformers

2. Construction Waste:

a. Masonry and CMU.
b. Insulation.
c. Carpet and Pad.
d. Gypsum board.
e. Piping.
f. Electrical conduit.

g. Lumber.
h. Wood sheet materials.
i. Wood trim.
j. Metals.
k. Roofing.
l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood or any type of recyclable crates, including shipping pallets
7) Plastic pails.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Each Prime Contractor shall implement approved waste management plan prepared by General Contractor. Each Prime Contractor shall provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."

B. Waste Management Coordinator: General Contractor shall employ a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan and for designating location and sizes of all containers during the Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating

materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site, designated by Owner.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING, DEMOLITION, AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Concrete Paving: Grind asphalt to maximum 1-1/2-inch size.

1. Crush asphaltic concrete paving and screen to comply with requirements in Section 312000 "Earth Moving" for use as general fill.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch size.
2. Crush concrete and screen to comply with requirements in Division 31 Section "Earth Moving" for use as satisfactory soil for fill or subbase.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 1-1/2-inch size.

    a. Crush masonry and screen to comply with requirements in Division 31 Section "Earth Moving" for use as general fill in the areas of structural additions.
    b. Crush masonry and screen to comply with requirements in Division 32

Section "Plants" for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

K. Carpet and Carpet Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

L. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Conduit: Reduce conduit to straight lengths and store by type and size.

O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.2 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

a. Comply with requirements in Division 32 Section "Plants" for use of clean ground gypsum board as inorganic soil amendment.

D. Paint: Seal containers and store by type.

3.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.4 ATTACHMENTS

A. The following sample CWM forms are included as Section 017419A:

1. Form CWM-1 for construction waste identification.
2. Form CWM-2 for demolition waste identification.
3. Form CWM-3 for construction waste reduction work plan.
4. Form CWM-4 for demolition waste reduction work plan.

5. Form CWM-5 for cost/revenue analysis of construction waste reduction work plan.
6. Form CWM-6 for cost/revenue analysis of demolition waste reduction work plan.
7. Form CWM-7 for construction waste reduction progress report.
8. Form CWM-8 for demolition waste reduction progress report.

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FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION

MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

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FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				
MATERIAL DESCRIPTION	**EST. QUANTITY**	**EST. VOLUME CY (CM)**	**EST. WEIGHT TONS (TONNES)**	**REMARKS AND ASSUMPTIONS**
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

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FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

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FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

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FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

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FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphalt Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

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FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

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FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphalt Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

SECTION 01 7700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of each prime contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Project closeout, including but not limited to:

1. Inspection procedures.
2. Warranties
3. Instruction of Owner's personnel
4. Project record document submittal.
5. Final cleaning.

B. Related Sections include the following

1. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for products of those Sections.
2. Division 01 Section 019113 "General Commissioning Requirements" for additional information and procedures.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following: List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion if claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise Owner of pending insurance change-over requirements.
3. Obtain and submit release enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

4. Submit record drawings, damage or settlement survey, and similar final record information.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Complete final clean-up requirements.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect, Owner and Construction Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, which must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. If a reinspection identifies work that remains uncompleted, the Contractor shall be responsible for the cost of additional inspections by the Architect and Construction Manager. The Architect and Construction Manager will submit a time and material invoice to the Owner, who will deduct the amount from the balance due to the contractor.
3. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following: List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an update final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Design Professional’s final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Design Professional.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Submit a Contractors Affidavit of Release of Liens using AIA Document G706A.
8. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
9. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
10. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, the Architect, Owner and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect, Owner, and Construction Manager will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. If a reinspection identifies work that remains uncompleted, the Contractor shall be responsible for the cost of additional inspections by the Architect and Construction Manager. The Architect and Construction Manager will submit a time and material invoice to the Owner, who will deduct the amount from the balance due to the contractor.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Design Professional’s reference during normal working hours.

B. Record of Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location of the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work
2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Design Professional for the Owner's records.

D. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

1.6 CLOSEOUT DOCUMENTATION SCHEDULE

A. Contractor to submit all final closeout documentation within forty-five (45) days of Substantial Completion. If all closeout documentation is not provided within the allotted time, the Owner reserves their right to initiate a fee of $1,000 per day past the forty-five days after Substantial Completion, until such time all closeout documentation has been received, reviewed, and accepted.

PART 2 - PRODUCTS (Not Applicable)

MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Each prime Contractor is responsible for final cleaning of the work included in their contract. The General Contractor is responsible for overall coordination of the final cleaning. If any Contractor fails to provide final cleaning as specified herein, the Owner reserves the right to perform the final cleaning either with their own personnel or an

outside agency. The cost of final cleaning if performed by the Owner or their representatives shall be deducted from the amount due to the contractor responsible. If the responsible contractor cannot be identified, the Owner will apportion the cost to each individual contractor, as necessary.

C. Cleaning: Employ experienced workers or professional cleaners for final cleaning.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
i. Clean and provide waxing for tile floors as indicated on the Construction Documents.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

E. Reestablishment of the Work Area

1. Reestablish local HVAC, mechanical and electrical systems in proper working order where needed.

2. Repair any damage that occurred as a result of demolition activities.

F. Project Close-Out

1. Within not more than twenty (20) days of the date of Substantial Completion and prior to the time that any final payment shall become due to the Prime Contractor, the Prime Contractor shall furnish to the Architect all certifications, test reports, disposal manifests and other documentation duly completed in accordance with the requirements of the Contract Documents and any applicable Federal, State or Local law.

END OF SECTION 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:

a. Operation and maintenance documentation directory.
b. Emergency manuals.
c. Operation manuals for systems, subsystems, and equipment.
d. Maintenance manuals for the care and maintenance of products, materials, finishes systems and equipment.

B. Related Sections: The following Sections contain requirements that relate to this Section:

a. Section 011200 "Multiple Contract Summary" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
b. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
c. Section 017700 "Closeout Procedures" for submitting operation and maintenance manuals.
d. Section 017839 "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
e. Section 019113 “General Commissioning Requirements” for verification and compilation of data into operation and maintenance manuals.
f. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for products in those Sections.

C. DEFINITIONS

1. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

2. Subsystem: A portion of a system with characteristics similar to a system.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the Owner's operation and maintenance personnel.

1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:

1. Before Substantial Completion, when each installation that requires operation and maintenance manuals is nominally complete, submit 2 draft copies of each manual to the Architect for review. Include a complete index or table of contents of each manual.

    a. The Architect will return 1 copy of the draft with comments within 15 days of receipt.

2. Submit 1 copy of data in final form at least 15 days before final inspection. The Architect will return this copy within 15 days after final inspection, with comments.
3. After final inspection, make corrections or modifications to comply with the Architect's comments. Submit the specified number of copies of each approved manual to the Architect within 15 days of receipt of the Architect's comments.

B. Form of Submittal: Prepare all operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Provide the Owner with a Flash Drive of PDF or other approved format files. Organize in a similar manner as a paper manual, with logical folders and sub-folders, and descriptive file names. If the Owner requests paper manuals, organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder for paper submittal.

1. Binders (if requested): For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11- inch (115-by-280-mm) paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.

a. Where 2 or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.
3. Protective Plastic Jackets: Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
4. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.
5. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.

    a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
    b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:
    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.

5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.

12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual index.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of Product Data, supplemented by Drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:

    a. Subject matter covered by the manual.
    b. Name and address of the Project.
    c. Date of submittal.
    d. Name, address, and telephone number of the Prime Contractor.
    e. Name and address of the Architect.
    f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

    a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.

3. General Information: Provide a general information Section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or Installer and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.

4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.

    a. Do not use original project record documents as part of operation and maintenance manuals.

7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit a flash drive, on material and finishes to the Architect for distribution. Provide one section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.

1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:

    a. Manufacturer's catalog number.
    b. Size.
    c. Material composition.
    d. Color.
    e. Texture.
    f. Reordering information for specially manufactured products.

2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Products Exposed to the Weather: Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.

1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:

a. Applicable standards.
b. Chemical composition.
c. Installation details.
d. Inspection procedures.
e. Maintenance information.
f. Repair procedures.

D. Schedule: Provide complete information in the materials and finishes manual on products specified in the following Sections:

1. Section 04 2000 – Unit Masonry Assembly
2. Section 05 5200 – Handrails and Railings
3. Section 07 1300 – Self Adhering Sheet Waterproofing
4. Section 07 5323 – EPDM Single Ply Membrane Roofing
5. Section 08 4114 – Aluminum-Framed Entrances and Storefronts
6. Section 08 7100 - Door Hardware
7. Section 08 8000 - Glazing
8. Section 09 6800 - Carpeting

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit a digital copy of each manual, in final form, on equipment and systems to the Architect for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:

a. Equipment or system function.
b. Operating characteristics.
c. Limiting conditions.
d. Performance curves.
e. Engineering data and tests.
f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:

a. Printed operation and maintenance instructions.
b. Assembly drawings and diagrams required for maintenance.
c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

    a. Routine operations.
    b. Troubleshooting guide.
    c. Disassembly, repair, and reassembly.
    d. Alignment, adjusting, and checking.

4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

    a. Startup procedures.
    b. Equipment or system break-in.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Instructions on stopping.
    f. Shutdown and emergency instructions.
    g. Summer and winter operating instructions.
    h. Required sequences for electric or electronic systems.
    i. Special operating instructions.

5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.

6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.

7. Coordination Drawings: Provide each Prime Contractor's Coordination Drawings.
    a. Provide as-installed, color-coded, piping diagrams, where required for identification.

8. Valve Tags: Provide charts of valve-tag numbers, with the location and function of each valve.

9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:
    a. Electric service.
    b. Controls.

C. Schedule: Provide complete information in the equipment and systems manual on all new equipment provided.

3.1 INSTRUCTIONS FOR THE OWNER'S PERSONNEL

A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

END OF SECTION 01 7823

SECTION 01 7836 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Prime Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Submittal Procedures" specifies procedures for submitting warranties.
2. Division 01 Section "Contract Closeout" specifies contract closeout procedures.
3. Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Prime Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Prime Contractor.

D. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own contract.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Prime Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Prime Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Prime Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Prime Contractor, or the Prime Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 02 through 28 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Prime Contractor, or by the Prime Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Provide digital copies of all warranties on a flash drive for the Owner to keep.
1. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 7836

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Miscellaneous record submittals.

B. Related Sections include the following:

1. Division 01 Section 011200 "Multiple Contract Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
2. Division 01 Section 017300 “Execution” for property survey requirements.
3. Division 01 Section 017700 "Closeout Procedures" for general closeout procedures.
4. Division 01 Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Division 01 Section 017419 “Construction Waste Management” for additional information and procedures.
6. Division 01 Section 019113 “General Commissioning Requirements” for additional information and procedures.
7. Divisions 02 through 33 Sections for specific requirements for Project Record Documents of products in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Each Prime Contractor shall scan and submit one marked-up .pdf set of record drawings electronically to the Architect and Construction Manager.
2. Submit each drawing whether or not changes and additional information were recorded.
3. Each Prime Contractor shall submit requirements of the Code Enforcement office and Township, City, and/or Boro officials on annotated PDF electronic files and directories and/or paper copies of each submittal as required.

B. Miscellaneous Record Submittals:

1. See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit required annotated PDF electronic files and directories and/or paper copies of each submittal as required.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect and Construction Manager.
    e. Name of Contractor.

C. Township, City, and Boro requirements for Record Drawings:

1. In addition to requirements specified in this section and other sections of the specifications, Record Drawings shall include the requirements of the Code Enforcement office and Township, City, and/or Boro officials.

1.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals in format required by Architect of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.6 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager’s reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of all systems, subsystems, and equipment.
2. Training in operation and maintenance of all systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for requirements for pre-instruction conferences.
2. Division 01 Section “Quality Requirements” for operational and maintenance procedures and training instruction qualifications.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a list of training modules and schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. At completion of training, submit two complete training manuals for Owner's use.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

E. Provide approved final Operations and Maintenance Manuals for use during the training sessions.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Schedule training only after all systems have been tested and are fully operational.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner’s personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. HVAC systems, , air distribution systems and terminal equipment and devices.
2. HVAC instrumentation and controls.
3. Electrical service and distribution system.
4. Packaged engine generators, including transfer switches.
5. Lighting equipment and controls.
6. Communication systems, including equipment. Inter-communication, clocks and programming voice and data and television.
7.
8. Fire suppression system.
9. Plumbing systems.
10. Equipment.
11. Finishes.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project Record Documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module(s). Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

C. Provide the final training manual, a site-specific agenda, and the resume of the training instructor to the Construction Manager two weeks prior to the scheduled training session.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling:

1. Schedule training only after system has been tested and is fully operational.
2. Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season. The Contractor shall include one initial training and schedule training with Owner, through CM, with at least fourteen days' advance notice. Start up and commissioning of systems must be completed before scheduling initial instructional session.
3. For major systems equipment, the Contractor shall include one (1) follow-up training to address questions or concerns from the Owner after the equipment has been in service for a period of six (6) to twelve (12) months.

D. Review all valve tags, labeling and access locations and provide summary or plans of all valves, shutoffs, and maintenance access locations.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately.

B. Documentation: Provide video of training session in digital format requested by Owner and provide access of files to Owner within 10 days of training session. One accessible copy must be provided on thumb drive or CD/DVD format.

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SECTION 01 8119 - INDOOR AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: This section provides requirements for Baseline Indoor Air Quality (IAQ) Testing for maximum indoor pollutant concentrations for acceptance of the facility.

B. Indoor Air Quality Testing (IAQ Testing): The Owner's Testing Agency shall conduct this testing outside of the Construction Contract and must provide a copy of the report documenting the results of IAQ testing. This IAQ testing shall be conducted with the cooperation of, and in coordination with, the GC, HVAC, EC and PC.

1.3 RELATED SECTIONS

A. Coordinate with Commissioning activities specified in Section 019113 "General Commissioning Requirements".

B. Coordinate with Division 23 Section "Testing, Adjusting and Balancing".

1.4 SUBMITTALS

A. Baseline IAQ Testing: Submit a report for each test site specified for IAQ baseline testing as prescribed herein below and in Division 23 "Testing, Adjusting, and Balancing." Report on air concentrations of targeted pollutants identified in Subsection 3.1 of this section.

1.5 SEQUENCING AND SCHEDULING

A. Identify, program, and schedule all IAQ testing well in advance of completing construction in a manner to prevent delays to the performance of the work of this Contract in order to perform and complete all testing after the completion of construction activities and prior to occupancy.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 BASELINE IAQ TESTING

A. HVAC System Verification: To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62.1-2010 or a local equivalent (whichever is more stringent), the HVAC Contractor shall verify the performance of each HVAC system prior to IAQ Testing, including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.

1. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site and poor housekeeping, shall be minimized.

B. Indoor Air Quality Testing: Upon verification of HVAC system operation the Owner may, at its discretion, hire an independent contractor to test levels of indoor air contaminants for compliance with specified requirements.

1. A test plan shall be submitted to all Contractors for coordination with their activities. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.
2. Conduct baseline IAQ testing using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
3. Perform IAQ testing for at least the minimum number of required sampling locations, determined as follows: For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation as calculated by Ventilation Rate Procedure of ASHRAE Standard -2010 or a local equivalent (whichever is more stringent), and greatest presumed source strength as identified by Owner.
    a) Verify areas to be tested with the Owner's Representative. Areas with 100% outside air ventilation rates, such as laboratories, are excluded from these testing requirements. The Owner's Representative is the sole judge of areas exempt from testing.
4. Perform IAQ testing following the completion of all interior construction activities and prior to occupancy. The building shall have all interior finishes installed, including but not limited to millwork, doors, paint, carpet and acoustic tiles. Perform testing prior to installation of furniture, workstation components, and casework.
5. Perform IAQ testing within the breathing zone, between 3’-0” and 6’-0” above the finished floor and over a minimum 4-hour period.
6. Collect air samples during normal occupied hours (prior to occupancy) with the building ventilation system starting at the daily normal start times and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing. .

7. Sample and record outside air levels of formaldehyde and TVOC contaminants at three outside air locations (as determined by Owner) simultaneously with indoor tests to establish basis of comparison for these contaminant levels by averaging the three outdoor readings for each contaminant.
8. Perform airborne mold and mildew sampling to identify species present with simultaneous indoor and outdoor readings.
9. Acceptance of respective portions of the building by the Owner is subject to compliance with specified limits of indoor air quality contaminant levels.

C. Compliance Indoor air quality shall conform to the following standards and limits:

1. Carbon Monoxide: Not to exceed 9 ppm.
2. Carbon Dioxide: Not to exceed 530 ppm higher than outdoor ambient levels.
3. Airborne Mold and Mildew: Indoor species distribution cannot vary by more than 10% from exterior sampling speciation.
4. Maximum Air Concentration Standards: Indoor room air concentration levels, emission rates, and qualities of the listed contaminants shall not exceed the limits specified in Table 3.1 below.

D. Test Reports: Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, a listing of any discrepancies and recommendations for corrective actions, if required.

1. Include certification of test equipment calibration with each test report.

E. For each sampling point where the maximum concentration limits listed in Table 3.1 are exceeded, the HVAC Contractor is responsible for conducting additional flush-out with outside air and retesting the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test. Retesting shall be performed at no additional expense to the Owner.

Table 3.1 MAXIMUM INDOOR AIR CONCENTRATION STANDARDS

Maxiumum concentration levels, by contaminant and testing method					
Contaminant			**Maximum concentration**	**ASTM and U.S. EPA methods**	**ISO method**
Particulates	**PM10** (for all buildings)		50 µg/m3 Healthcare only: 20 µg/m3	EPA Compendium Method IP-10	ISO 7708
	PM2.5 (for buildings in EPA nonattainment areas for PM2.5, or local equivalent)		15 µg/m3		
Ozone (for buildings in EPA nonattainment areas for Ozone, or local equivalent)			0.075 ppm	ASTM D5149 - 02	ISO 13964
Carbon monoxide (CO)			9 ppm; no more than 2 ppm above outdoor levels	EPA Compendium Method IP-3	ISO 4224
Total volatile organic compounds (TVOCs)			500 µg/m3 Healthcare only: 200 µg/m3	EPA TO-1, TO-17, or EPA Compendium Method IP-1	ISO 16000-6
Formaldehyde			27 ppb Healthcare only: 16.3 ppb	ASTM D5197, EPA TO-11, or EPA Compendium Method IP-6	ISO 16000-3
Target volatile organic compounds*	1	Acetaldehyde	140 µg/m3		
	2	Benzene	3 µg/m3	ASTM D5197, EPA TO-1, TO-17, or EPA Compendium Method IP-1	ISO 16000-3, ISO16000-6
	3	Carbon disulfide	800 µg/m3		
	4	Carbon tetrachloride	40 µg/m3		
	5	Chlorobenzene	1000 µg/m3		
	6	Chloroform	300 µg/m3		
	7	Dichlorobenzene (1,4-)	800 µg/m3		
	8	Dichloroethylene (1,1)	70 µg/m3		
	9	Dimethylformamide (N,N-)	80 µg/m3		
	10	Dioxane (1,4-)	3000 µg/m3		
	11	Epichlorohydrin	3 µg/m3		
	12	Ethylbenzene	2000 µg/m3		
	13	Ethylene glycol	400 µg/m3		
	14	Ethylene glycol monoethyl ether	70 µg/m3		
	15	Ethylene glycol monoethyl ether acetate	300 µg/m3		
	16	Ethylene glycol monomethyl ether	60 µg/m3		
	17	Ethylene glycol monomethyl ether acetate	90 µg/m3		
	18	Hexane (n-)	7000 µg/m3		
	19	Isophorone	2000 µg/m3		
	20	Isopropanol	7000 µg/m3		
	21	Methyl chloroform	1000 µg/m3		
	22	Methylene chloride	400 µg/m3		
	23	Methyl *t*-butyl ether	8000 µg/m3		
	24	Naphthalene	9 µg/m3		
	25	Phenol	200 µg/m3		
	26	Propylene glycol monomethyl ether	7000 µg/m3		
	27	Styrene	900 µg/m3		
	28	Tetrachloroethylene (Perchloroethylene)	35 µg/m3		
	29	Toluene	300 µg/m3		
	30	Trichloroethylene	600 µg/m3		
	31	Vinyl acetate	200 µg/m3		
	32-34	Xylenes, technical mixture (m-, o-, pxylene combined)	700 µg/m3		

ELEMENT ENVIRONMENTAL
S O L U T I O N S

October 29, 2026

Mr. Barry P. Luber
Township Manager
Upper Providence Township
935 North Providence Road
Media, PA 19063

RE: Hazardous Materials Investigation
Upper Providence Township Municipal Complex
E2S Project 1574.0001

Dear Mr. Luber

Element Environmental Solutions, Inc. (E2S) was contracted by Upper Providence Township to perform a hazardous materials investigation of the existing buildings (Township Administration Building, District Court Building, and Service Garage) at the Upper Providence Township Municipal Complex located at 935 North Providence Road, Media, Pennsylvania. The purpose of the investigation was to identify any hazardous materials that could be impacted by future renovations to the buildings.

Introduction

Representatives from E2S, Messrs. Michael Seifrit, Boston Patton, and Carter Nuneville, were on site on Tuesday, October 20, 2026, to perform the hazardous materials investigation. The investigation included a visual inspection and sampling for asbestos-containing materials (ACM) and lead based paint (LBP), a visual inspection for mercury and PCB-containing devices and equipment, and any other potentially hazardous or environmentally regulated materials. Messrs. Seifrit and Patton are Environmental Protection Agency (EPA) certified Asbestos Building Inspectors and are licensed as such by the Pennsylvania Department of Labor and Industry (Pa DLI). See Appendix B for copies of the licenses.

Summary

Our representatives performed an initial walkthrough of the buildings (Township Administration Building, District Court Building, and Service Garage) to locate suspect ACM, lead based paint (LBP), and locate suspect light ballasts, light tubes, electronic devices, etc., and documented all findings on field data forms. Based upon the visual inspection, bulk samples were collected of suspect ACM and suspect LBP. The samples were submitted to an accredited laboratory for asbestos analysis by Polarized Light Microscopy (PLM) and for lead analysis by Flame Atomic Absorption Spectroscopy (Flame AAS). The laboratory utilized for this project was: EMSL Analytical, Inc. located in Cinnaminson, New Jersey. EMSL is an American Industrial Hygiene Association (AIHA) and a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory for asbestos PLM analysis and a National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory for lead Flame AAS analysis.

Samples were not collected of suspect materials for mercury or PCBs due to destructive sampling methods required; however, E2S visually inspected labels and devices, if found, for documentation pertaining to the content of the materials. If required, assumptions were made to err on the side of caution when handling and disposing or recycling of these materials.

The results and findings of the investigation are summarized below and on the referenced tables, for each material referenced above.

Township Administration Building

Asbestos

The following suspect materials were identified, sampled, and determined to contain asbestos at EPA-regulated levels (>1%):

- **Beige Floor Tile**

The following suspect materials were identified, sampled, and determined NOT to contain asbestos:

- Textured 1' x 1' Floor Tile
- Textured 1' x 1' Floor Tile Mastic (Yellow)
- Teal Floor Tile
- Teal Floor Tile Mastic (Yellow)
- Floor Tile (Gray)
- Floor Tile (Gray) Mastic (Gray/Yellow)
- Streak Floor Tile
- Streak Floor Tile Mastic (Brown/White/Yellow)
- Beige Floor Tile Mastic (Black)
- Floor Leveler
- Teal Spec Floor Tile
- Teal Spec Floor Tile Mastic (Yellow)
- Teal Spec Floor Tile Mastic (Beige)
- 9" x 9" Floor Tile
- 9" x 9" Floor Tile Mastic (Yellow)
- Non-Slip Floor Tile
- Non-Slip Floor Tile Mastic (Tan)
- Green Flooring Material
- Green Flooring Material Mastic (Black/Yellow)
- White with Blue Spec 1' x 1' Floor Tile
- White with Blue Spec 1' x 1' Floor Tile Mastic (Yellow)
- Drywall
- Joint Compound
- Door/Window Caulk
- Carpet Mastic (Tan)
- Carpet Mastic (Gray/Tan)
- 2' x 4' Ceiling Tile
- 2' x 2' Ceiling Tile (Textured)
- Carpet Mastic (Gray/Green)

- Drywall Ceiling
- Roof Shingle
- Building Expansion Caulk

Please refer to Table 1 for a summary of bulk sample analytical results, and to Table 3 for a summary of findings and estimated abatement costs for all identified ACM.

Lead

E2S performed composite lead-based paint chip sampling of various painted surfaces and components throughout the building. The EPA/HUD definition of LBP (>0.5 % wt by laboratory analysis) was used as a threshold to identify LBP. Refer to Table 2 for a summary of paint chip sample analytical results.

The following painted surfaces were identified, tested, and determined to contain lead at EPA/HUD regulated, lead-based paint (LPB) levels, as defined above:

- **None**

The following painted surface was identified, tested, and determined **NOT** to contain lead at EPA/HUD regulated, lead-based paint (LPB) levels, as defined above:

- Interior Door/Door Frame Paint
- Interior Wall Paint
- Interior Block Wall Paint
- Exterior Wood Components Paint
- Exterior Window Shutter Paint

Surfaces containing LBP, as well as surfaces containing any detectable amount of lead, are regulated by the Occupational Health and Safety Administration (OSHA). Therefore, all construction work that impacts painted components containing lead shall be performed in accordance with the OSHA Lead-in Construction Standard (29 CFR 1926.62), as applicable to the work being performed; and a proper waste management plan shall be utilized to certify that the waste is properly disposed or recycled. Contractors working on the project are responsible for fulfilling all applicable OSHA requirements pertaining to lead, as well as all other applicable federal, state or local requirements or regulations pertaining to lead-based paint or lead-in construction.

PCB's, Mercury, and Other Suspect Hazardous Materials

Light ballasts were randomly inspected, and ballasts visually checked were determined to be ballasts labeled with the "No PCBs" notation. The lighting systems were of various types, and types of ballasts varied depending on type of light fixtures. The ballasts which are demarcated as non-PCB containing may be recycled as non-PCB ballasts in accordance with applicable industry standards for those types of ballasts. PCB ballasts (labeled PCBs or not labeled "No PCBs"), if encountered, should be recycled as PCB ballasts in a facility that accepts PCB ballasts as universal waste. Any leaking ballasts would need to be disposed of as hazardous waste, unless testing is performed to classify the waste for PCBs.

Fluorescent light tubes were also visually inspected and are assumed to contain some amounts of mercury that could deem them "hazardous waste" for disposal purposes. E2S recommends that all

tubes be removed prior to renovations involving the lighting fixtures and sent for recycling as universal waste, to a facility that accepts mercury-containing light tubes as part of their universal waste program.

Please refer to Table 3 for a breakdown of estimated abatement costs for all hazardous materials identified including costs for PCB's and Mercury recycling. Estimated recycling costs for mercury and PCB containing items are based upon pricing and discussions with a reputable recycling facility located in Allentown, Pennsylvania and include recycling fees only; transportation fees and labor costs to remove light fixtures/devices are not included. We recommend a certified recycling facility is utilized to handle all mercury/PCB hazardous material recycling, as necessary.

District Court Building

Asbestos

The following suspect materials were identified, sampled, and determined to contain asbestos at EPA-regulated levels (>1%):

- **None**

The following suspect materials were identified, sampled, and determined NOT to contain asbestos:

- 2' x 2' Ceiling Tile
- Drywall
- Joint Compound
- Carpet Mastic (Yellow/Green)
- Door/Window Caulk
- Roof Shingle

Please refer to Table 1 for a summary of bulk sample analytical results, and to Table 3 for a summary of findings and estimated abatement costs for all identified ACM.

Lead

E2S performed composite lead-based paint chip sampling of various painted surfaces and components throughout the building. The EPA/HUD definition of LBP (>0.5 % wt by laboratory analysis) was used as a threshold to identify LBP. Refer to Table 2 for a summary of paint chip sample analytical results.

The following painted surfaces were identified, tested, and determined to contain lead at EPA/HUD regulated, lead-based paint (LPB) levels, as defined above:

- **None**

The following painted surface was identified, tested, and determined **NOT** to contain lead at EPA/HUD regulated, lead-based paint (LPB) levels, as defined above:

- Interior Door/Door Frame Paint
- Interior Wall Paint
- Interior Window/Window Frame Paint
- Exterior Wood Components Paint

Surfaces containing LBP, as well as surfaces containing any detectable amount of lead, are regulated by the Occupational Health and Safety Administration (OSHA). Therefore, all construction work that impacts painted components containing lead shall be performed in accordance with the OSHA Lead-in Construction Standard (29 CFR 1926.62), as applicable to the work being performed; and a proper waste management plan shall be utilized to certify that the waste is properly disposed or recycled. Contractors working on the project are responsible for fulfilling all applicable OSHA requirements pertaining to lead, as well as all other applicable federal, state or local requirements or regulations pertaining to lead-based paint or lead-in construction.

PCB's, Mercury, and Other Suspect Hazardous Materials

Light ballasts were randomly inspected, and ballasts visually checked were determined to be ballasts labeled with the "No PCBs" notation. The lighting systems were of various types, and types of ballasts varied depending on type of light fixtures. The ballasts which are demarcated as non-PCB containing may be recycled as non-PCB ballasts in accordance with applicable industry standards for those types of ballasts. PCB ballasts (labeled PCBs or not labeled "No PCBs"), if encountered, should be recycled as PCB ballasts in a facility that accepts PCB ballasts as universal waste. Any leaking ballasts would need to be disposed of as hazardous waste, unless testing is performed to classify the waste for PCBs.

Fluorescent light tubes were also visually inspected and are assumed to contain some amounts of mercury that could deem them "hazardous waste" for disposal purposes. E2S recommends that all tubes be removed prior to renovations involving the lighting fixtures and sent for recycling as universal waste, to a facility that accepts mercury-containing light tubes as part of their universal waste program.

Please refer to Table 3 for a breakdown of estimated abatement costs for all hazardous materials identified including costs for PCB's and Mercury recycling. Estimated recycling costs for mercury and PCB containing items are based upon pricing and discussions with a reputable recycling facility located in Allentown, Pennsylvania and include recycling fees only; transportation fees and labor costs to remove light fixtures/devices are not included. We recommend a certified recycling facility is utilized to handle all mercury/PCB hazardous material recycling, as necessary.

Service Garage

Asbestos

The following suspect materials were identified, sampled, and determined to contain asbestos at EPA-regulated levels (>1%):

- **None**

The following suspect materials were identified, sampled, and determined NOT to contain asbestos:

- Light Brown 1' x 1' Floor Tile
- Drywall
- Joint Compound
- 2' x 4' Ceiling Tile
- Building Expansion Caulk

Please refer to Table 1 for a summary of bulk sample analytical results, and to Table 3 for a summary of findings and estimated abatement costs for all identified ACM.

Lead

E2S performed composite lead-based paint chip sampling of various painted surfaces and components throughout the building. The EPA/HUD definition of LBP (>0.5 % wt by laboratory analysis) was used as a threshold to identify LBP. Refer to Table 2 for a summary of paint chip sample analytical results.

The following painted surfaces were identified, tested, and determined to contain lead at EPA/HUD regulated, lead-based paint (LPB) levels, as defined above:

- **None**

The following painted surface was identified, tested, and determined **NOT** to contain lead at EPA/HUD regulated, lead-based paint (LPB) levels, as defined above:

- Interior Door/Door Frame Paint
- Interior Block Wall Paint
- Exterior Block Wall Paint
- Garage Door Frame Paint

Surfaces containing LBP, as well as surfaces containing any detectable amount of lead, are regulated by the Occupational Health and Safety Administration (OSHA). Therefore, all construction work that impacts painted components containing lead shall be performed in accordance with the OSHA Lead-in Construction Standard (29 CFR 1926.62), as applicable to the work being performed; and a proper waste management plan shall be utilized to certify that the waste is properly disposed or recycled. Contractors working on the project are responsible for fulfilling all applicable OSHA requirements pertaining to lead, as well as all other applicable federal, state or local requirements or regulations pertaining to lead-based paint or lead-in construction.

PCB's, Mercury, and Other Suspect Hazardous Materials

Light ballasts were randomly inspected, and ballasts visually checked were determined to be ballasts labeled with the "No PCBs" notation. The lighting systems were of various types, and types of ballasts varied depending on type of light fixtures. The ballasts which are demarcated as non-PCB containing may be recycled as non-PCB ballasts in accordance with applicable industry standards for those types of ballasts. PCB ballasts (labeled PCBs or not labeled "No PCBs"), if encountered, should be recycled as PCB ballasts in a facility that accepts PCB ballasts as universal waste. Any leaking ballasts would need to be disposed of as hazardous waste, unless testing is performed to classify the waste for PCBs.

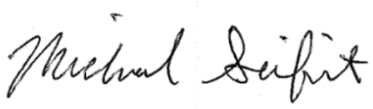
Fluorescent light tubes were also visually inspected and are assumed to contain some amounts of mercury that could deem them "hazardous waste" for disposal purposes. E2S recommends that all tubes be removed prior to renovations involving the lighting fixtures and sent for recycling as universal waste, to a facility that accepts mercury-containing light tubes as part of their universal waste program.

Please refer to Table 3 for a breakdown of estimated abatement costs for all hazardous materials identified including costs for PCB's and Mercury recycling. Estimated recycling costs for mercury and PCB containing items are based upon pricing and discussions with a reputable recycling facility located in Allentown, Pennsylvania and include recycling fees only; transportation fees and labor costs to remove light fixtures/devices are not included. We recommend a certified recycling facility is utilized to handle all mercury/PCB hazardous material recycling, as necessary.

Please refer to Table 1 for a summary of asbestos bulk sampling and results, Table 2 for a summary of lead-based paint chip sampling and results, and Table 3 for a summary of findings and cost estimates for abatement of identified hazardous materials. Laboratory analytical reports from EMSL Analytical, Inc. for the PLM asbestos bulk samples and Flame AAS paint chip samples collected by E2S are included in Appendix A, and accreditations (certifications and licenses) for E2S representatives are included in Appendix B.

Thank you for the opportunity to present Element Environmental Solutions (E2S) as a partner in your environmental management efforts. Should you have questions or require additional information, please contact me.

Sincerely,
E2S, Inc.



Michael Seifrit
Environmental Scientist, IAQ

Table 1 - Asbestos Bulk Sample Analytical Results - Upper Providence Township Municipal Complex

Note: These are existing room names/numbers - not corresponding to the new plan.

Sample Number	Building	Sample Location	Material Description	Analytical Result (PLM)
TAB-10/20-01BK-Floor Tile	Township Administration Building	Patrol Room 128	Textured 1' x 1' Floor Tile	None Detected
TAB-10/20-01BK-Mastic	Township Administration Building	Patrol Room 128	Textured 1' x 1' Floor Tile Mastic (Yellow)	None Detected
TAB-10/20-02BK-Floor Tile	Township Administration Building	Patrol Room 128	Teal Floor Tile	None Detected
TAB-10/20-02BK-Mastic	Township Administration Building	Patrol Room 128	Teal Floor Tile Mastic (Yellow)	None Detected
TAB-10/20-03BK-Floor Tile	Township Administration Building	Room 133 Detective	Floor Tile (Gray)	None Detected
TAB-10/20-03BK-Mastic	Township Administration Building	Room 133 Detective	Floor Tile (Gray) Mastic (Gray/Yellow)	None Detected
TAB-10/20-04BK-Floor Tile	Township Administration Building	Room 102 Files	Streak Floor Tile	None Detected
TAB-10/20-04BK-Mastic	Township Administration Building	Room 102 Files	Streak Floor Tile Mastic (Brown/White/Yellow)	None Detected
TAB-10/20-05BK-Floor Tile	**Township Administration Building**	**Corridor 119**	**Beige Floor Tile**	**4% Chrysotile**
TAB-10/20-05BK-Mastic	Township Administration Building	Corridor 119	Beige Floor Tile Mastic (Black)	None Detected
TAB-10/20-05BK-Leveler	Township Administration Building	Corridor 119	Floor Leveler	None Detected
TAB-10/20-06BK-Floor Tile	Township Administration Building	Locker Room 126	Teal Spec Floor Tile	None Detected
TAB-10/20-06BK-Mastic	Township Administration Building	Locker Room 126	Teal Spec Floor Tile Mastic (Yellow)	None Detected
TAB-10/20-06BK-Mastic 2	Township Administration Building	Locker Room 126	Teal Spec Floor Tile Mastic (Beige)	None Detected
TAB-10/20-07BK-Floor Tile	Township Administration Building	Corridor 115 Stair Closet	9" x 9" Floor Tile	None Detected
TAB-10/20-07BK-Mastic	Township Administration Building	Corridor 115 Stair Closet	9" x 9" Floor Tile Mastic (Yellow)	None Detected
TAB-10/20-08BK-Floor Tile	Township Administration Building	Council Room 107	Non-Slip Floor Tile	None Detected
TAB-10/20-08BK-Mastic	Township Administration Building	Council Room 107	Non-Slip Floor Tile Mastic (Tan)	None Detected
TAB-10/20-09BK-Flooring	Township Administration Building	Vestibule 122	Green Flooring Material	None Detected
TAB-10/20-09BK-Mastic	Township Administration Building	Vestibule 122	Green Flooring Material Mastic (Black/Yellow)	None Detected
TAB-10/20-10BK-Floor Tile	Township Administration Building	Room 108 Files	White with Blue Spec Floor Tile	None Detected
TAB-10/20-10BK-Mastic	Township Administration Building	Room 108 Files	White with Blue Spec Floor Tile Mastic (Yellow)	None Detected
TAB-10/20-11BK-Drywall	Township Administration Building	Corridor 110	Drywall	None Detected
TAB-10/20-11BK-Joint Compound	Township Administration Building	Corridor 110	Joint Compound	None Detected
TAB-10/20-12BK	Township Administration Building	Exterior	Door/Window Caulk	None Detected
TAB-10/20-13BK	Township Administration Building	Hall at Room 105 Township Manager	Carpet Mastic (Tan)	None Detected
TAB-10/20-14BK	Township Administration Building	Room 103 Administration	Carpet Mastic (Gray/Tan)	None Detected
TAB-10/20-15BK	Township Administration Building	Patrol Room 128	2' x 4' Ceiling Tile	None Detected
TAB-10/20-16BK	Township Administration Building	Corridor 119	2' x 2' Ceiling Tile (Textured)	None Detected
TAB-10/20-17BK	Township Administration Building	Room 134 Police Secretary	Carpet Mastic (Gray/Green)	None Detected
TAB-10/20-18BK	Township Administration Building	Patrol Room 128	Drywall Ceiling	None Detected
TAB-10/20-19K	Township Administration Building	Exterior	Roof Shingle	None Detected
TAB-10/20-20BK	Township Administration Building	Exterior	Building Expansion Caulk	None Detected
DC-10/20-01BK	District Court Building	Court Room	2' x 2' Ceiling Tile	None Detected
DC-10/20-02BK-Drywall	District Court Building	Hallway	Drywall	None Detected
DC-10/20-02BK-Joint Compound	District Court Building	Hallway	Joint Compound	None Detected
DC-10/20-03BK	District Court Building	Hallway	Carpet Mastic (Yellow/Green)	None Detected
DC-10/20-04BK	District Court Building	Exterior	Door/Window Caulk	None Detected
DC-10/20-05BK	District Court Building	Exterior	Roof Shingle	None Detected
SG-10/20-01BK	Service Garage	Office	Light Brown 1' x 1' Floor Tile	None Detected
SG-10/20-02BK-Drywall	Service Garage	Bathroom	Drywall	None Detected
SG-10/20-02BK-Joint Compound	Service Garage	Bathroom	Joint Compound	None Detected
SG-10/20-03BK	Service Garage	Bathroom	2' x 4' Ceiling Tile	None Detected
SG-10/20-04BK	Service Garage	Exterior	Building Expansion Caulk	None Detected

EPA definition of asbestos-containing material (ACM) = >1% asbestos (line items BOLD)

Table 2 - Lead Paint Chip Sample Analytical Results - Upper Providence Township Municipal Complex

Sample Number	Building	Location	Material Description	Analytical Result (Flame AAS)
TAB-10/20-01PC	Township Administration Building	Throughout	Interior Door/Door Frame Paint (Composite)	0.013 % wt
TAB-10/20-02PC	Township Administration Building	Throughout	Interior Wall Paint (Composite)	< 0.0068 % wt
TAB-10/20-03PC	Township Administration Building	Throughout	Interior Block Wall Paint (Composite)	0.018 % wt
TAB-10/20-04PC	Township Administration Building	Exterior	Exterior Wood Components Paint (Composite)	< 0.0064 % wt
TAB-10/20-05PC	Township Administration Building	Exterior	Exterior Window Shutter Paint (Composite)	0.27 % wt
DCB-10/20-01PC	District Court Building	Throughout	Interior Door/Door Frame Paint (Composite)	< 0.015 % wt
DCB-10/20-02PC	District Court Building	Throughout	Interior Wall Paint (Composite)	< 0.0064 % wt
DCB-10/20-03PC	District Court Building	Throughout	Interior Window/Window Frame Paint (Composite)	< 0.0064 % wt
DCB-10/20-04PC	District Court Building	Exterior	Exterior Wood Components Paint (Composite)	< 0.0066 % wt
SG-10/20-01PC	Service Garage	Throughout	Interior Door/Door Frame Paint (Composite)	< 0.0073 % wt
SG-10/20-02PC	Service Garage	Throughout	Interior Block Wall Paint (Composite)	< 0.0064 % wt
SG-10/20-03PC	Service Garage	Exterior	Exterior Block Wall Paint (Composite)	< 0.0064 % wt
SG-10/20-04PC	Service Garage	Exterior	Garage Door Frame Paint (Composite)	< 0.0070 % wt

EPA definition of lead-based paint (LBP) = > 0.5% lead (line items BOLD)

Note: These are existing room names/numbers - not corresponding to the new plan.

Table 3 - Summary of Findings and Estimated Removal Costs - Upper Providence Township Municipal Complex

Building	Location	Material Description	Estimated Quantity	Estimated Cost
Township Administration Building	Corridor 119 (Outside Interview 129 and Chief 130)	ACM Beige Floor Tile (Under Carpet)	112 S.F.	$900.00
Mobilization Fee			1	$2,000.00
TOTAL - Asbestos Abatement - Estimated Removal Costs				**$2,900.00**
Township Administration Building	Throughout	Mercury-Containing Light Tubes (Assumed)	102 Tubes	$102.00
Township Administration Building	Throughout	Light Ballasts (No PCB's)	51 Ballasts	$102.00
District Court Building	Throughout	Mercury-Containing Light Tubes (Assumed)	78 Tubes	$78.00
District Court Building	Throughout	Light Ballasts (No PCB's)	39 Ballasts	$78.00
Service Garage	Throughout	Mercury-Containing Light Tubes (Assumed)	20 Tubes	$20.00
Service Garage	Throughout	Light Ballasts (No PCB's)	10 Ballasts	$20.00
TOTAL - Hazardous Materials (Recycling fees only, does not include labor for removal or transportation fees)				**$400.00**

Note: Estimated asbestos abatement/removal costs are based on typical unit costs assuming all materials are removed during one (1) site mobilization. If materials are removed in small quanitites, a minimum contractor mobilization fee of $1,500-$2,000 should be added to the estimated costs, as applicable.

ACM = Asbestos-Containing Material

Appendix A

Laboratory Analytical Reports – EMSL Analytical, Inc.

Asbestos Bulk - Polarized Light Microscopy (PLM)

Lead Paint Chip – Flame Atomic Absorption Spectroscopy (Flame AAS)

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042622365
Customer ID:	ELES42
Customer PO:	1574.0001
Project ID:	

Attention:	David Bertsch	**Phone:**	(717) 484-5111
	Element Environmental Solutions, Inc.	**Fax:**	
	61 Willow Street	**Received Date:**	10/22/2026 9:40 AM
	PO Box 921	**Analysis Date:**	10/28/2026
	Adamstown, PA 19501	**Collected Date:**	10/20/2026
Project:	Township Admin Building		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
TAB-10/20-01BK-Floor Tile *042622365-0001*	Patrol Room 128 - Texture 1x1 Floor Tile	Gray Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
TAB-10/20-01BK-Mastic *042622365-0001A*	Patrol Room 128 - Mastic	Yellow Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
TAB-10/20-02BK-Floor Tile *042622365-0002*	Patrol Room 128 (Under Texture FT) - Teal Floor Tile	Blue Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
TAB-10/20-02BK-Mastic *042622365-0002A*	Patrol Room 128 (Under Texture FT) - Mastic	Yellow Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
TAB-10/20-03BK-Floor Tile *042622365-0003*	Room 133 Detective - Floor Tile (Gray)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
TAB-10/20-03BK-Mastic *042622365-0003A* *Result includes a small amount of inseparable attached leveler.*	Room 133 Detective - Mastic	Gray/Yellow Non-Fibrous Heterogeneous		15% Ca Carbonate 85% Non-fibrous (Other)	None Detected
TAB-10/20-04BK-Floor Tile *042622365-0004*	Room 102 Files - Streak Floor Tile	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
TAB-10/20-04BK-Mastic *042622365-0004A* *Result includes a small amount of inseparable attached material*	Room 102 Files - Mastic	Brown/White/Yellow Non-Fibrous Heterogeneous		15% Quartz 15% Ca Carbonate 70% Non-fibrous (Other)	None Detected
TAB-10/20-05BK-Floor Tile *042622365-0005*	Corridor 119 - Beige Floor Tile	Beige Fibrous Homogeneous		15% Quartz 81% Non-fibrous (Other)	**4% Chrysotile**
TAB-10/20-05BK-Mastic *042622365-0005A*	Corridor 119 - Mastic	Black Non-Fibrous Homogeneous	4% Cellulose	96% Non-fibrous (Other)	None Detected
TAB-10/20-05BK-Leveler *042622365-0005B* *Result includes a small amount of inseparable attached material*	Corridor 119 - Leveler	Gray/Yellow/Green Fibrous Heterogeneous	2% Fibrous (Other)	15% Ca Carbonate 83% Non-fibrous (Other)	None Detected
TAB-10/20-06BK-Floor Tile *042622365-0006*	Locker Room 126 - Teal Spec Floor Tile	Blue Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
TAB-10/20-06BK-Mastic *042622365-0006A*	Locker Room 126 - Mastic	Yellow Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected

Initial report from: 10/28/2026 11:55:15

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042622365
Customer ID:	ELES42
Customer PO:	1574.0001
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
TAB-10/20-06BK-Mastic 2 *042622365-0006B*	Locker Room 126 - Mastic	Beige Fibrous Homogeneous	6% Cellulose 3% Synthetic	91% Non-fibrous (Other)	None Detected
TAB-10/20-07BK-Floor Tile *042622365-0007*	Corridor 115 Stair Closet - 9x9 Floor Tile	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
TAB-10/20-07BK-Mastic *042622365-0007A*	Corridor 115 Stair Closet - Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
TAB-10/20-08BK-Floor Tile *042622365-0008*	Council Room 107 - Non-Slip Floor Tile	Gray Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
TAB-10/20-08BK-Mastic *042622365-0008A*	Council Room 107 - Mastic	Tan Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
TAB-10/20-09BK-Flooring *042622365-0009*	Vestibule 122 - Green Flooring Material	Green Fibrous Homogeneous	20% Synthetic	80% Non-fibrous (Other)	None Detected
TAB-10/20-09BK-Mastic *042622365-0009A*	Vestibule 122 - Mastic	Black/Yellow Non-Fibrous Heterogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
TAB-10/20-10BK-Floor Tile *042622365-0010*	Room 108 Files - White w/Blue Spec FT	White Non-Fibrous Homogeneous		15% Quartz 85% Non-fibrous (Other)	None Detected
TAB-10/20-10BK-Mastic *042622365-0010A*	Room 108 Files - Mastic	Yellow Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
TAB-10/20-11BK-Drywall *042622365-0011*	Corridor 110 - Drywall	Brown/White Fibrous Homogeneous	15% Cellulose 5% Glass	60% Gypsum 20% Non-fibrous (Other)	None Detected
TAB-10/20-11BK-Joint Compound *042622365-0011A*	Corridor 110 - Joint Compound	White Non-Fibrous Homogeneous		60% Ca Carbonate 40% Non-fibrous (Other)	None Detected
TAB-10/20-12BK *042622365-0012*	Exterior - Door/Window Caulk	White Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
TAB-10/20-13BK *042622365-0013*	Hall at Room 105 Township Manager - Carpet Mastic	Tan Non-Fibrous Homogeneous		10% Ca Carbonate 90% Non-fibrous (Other)	None Detected
TAB-10/20-14BK *042622365-0014*	Room 103 Administration - Carpet Mastic	Gray/Tan Non-Fibrous Homogeneous		80% Matrix 20% Non-fibrous (Other)	None Detected
TAB-10/20-15BK *042622365-0015*	Patrol Room 128 - 2x4 Ceiling Tile	Tan/White Fibrous Homogeneous	50% Cellulose 30% Min. Wool	10% Perlite 10% Non-fibrous (Other)	None Detected
TAB-10/20-16BK *042622365-0016*	Corridor 119 - 2x2 CT (Textured)	Gray Non-Fibrous Homogeneous	80% Min. Wool	20% Non-fibrous (Other)	None Detected
TAB-10/20-17BK *042622365-0017*	Room 134 Police Secretary - Green Carpet Mastic	Gray/Green Fibrous Heterogeneous	2% Fibrous (Other)	20% Ca Carbonate 78% Non-fibrous (Other)	None Detected

Result includes a small amount of inseparable attached material

Initial report from: 10/28/2026 11:55:15

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042622365
Customer ID:	ELES42
Customer PO:	1574.0001
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
TAB-10/20-18BK *042622365-0018*	Patrol Room 128 - Drywall Ceiling	Brown/White Fibrous Homogeneous	20% Cellulose	60% Gypsum 20% Non-fibrous (Other)	None Detected
TAB-10/20-19BK *042622365-0019*	Exterior - Roof Shingle	Red/Black Non-Fibrous Homogeneous	10% Glass	20% Quartz 70% Non-fibrous (Other)	None Detected
TAB-10/20-20BK *042622365-0020*	Exterior - Building Expansion Caulk (White)	Tan/White Non-Fibrous Homogeneous		5% Quartz 10% Ca Carbonate 85% Non-fibrous (Other)	None Detected

Analyst(s)
Giavanna Marcolongo (33)

Samantha Sweeney

Samantha Sweeney, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 10/28/2026 11:55:15

OrderID: 042622365

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only*): 042622365

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

Company: Element Environmental Solutions	**EMSL-Bill to:** ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: 61 Willow Street PO Box 921	
City: Adamstown **State/Province:** PA	**Zip/Postal Code:** 19501 **Country:** United States
Report To (Name): David Bertsch	**Telephone #:** 717-484-5111
Email Address: IAQ@e2s.us	**Fax #:** **Purchase Order:** 1574.0001
Project Name/Number: Township Admin Building	**Please Provide Results:** ☐ Fax ☑ Email ☐ Mail
U.S. State Samples Taken: PA	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PLM - Bulk (reporting limit)

- ☒ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NY ELAP Method 198.1 (friable in NY)
- ☐ NY ELAP Method 198.6 NOB (non-friable-NY)
- ☐ OSHA ID-191 Modified
- ☐ Standard Addition Method

TEM – Bulk

- ☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
- ☐ NY ELAP Method 198.4 (TEM)
- ☐ Chatfield Protocol (semi-quantitative)
- ☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
- ☐ TEM Qualitative via Filtration Prep Technique
- ☐ TEM Qualitative via Drop Mount Prep Technique

Other

- ☐

RECEIVED EMSL CINNAMINSON, NJ 2026 OCT 22 P 2:21

☐ **Check For Positive Stop – Clearly Identify Homogenous Group** **Date Sampled:** 10/20/2026

Samplers Name: Boston Patton **Samplers Signature:** Boston Patton

Sample #	~~PLM#~~	Sample Location	Material Description
TAB-10/20	01BK	Patrol Room 128	Texture 1x1 Floor Tile
-	02BK	Patrol Room 128 (under Texture FT)	Teal Floor Tile
-	03BK	Room 133 Detective	Floor Tile (Gray)
-	04BK	Room 102 Files	Streak Floor Tile
-	05BK	Corridor 119	Beige Floor Tile
-	06BK	Locker Room 126	Teal Spec Floor Tile
-	07BK	Corridor 115 Stair Closet	9x9 Floor Tile
-	08BK	Council Room 107	Non-Slip Floor Tile
-	09BK	Vestibule 122	Green Flooring Material
-	10BK	Room 108 Files	White w/ Blue Spec FT

Client Sample # (s): - **Total # of Samples:** 20

Relinquished (Client): Boston Patton **Date:** 10/21/2026 **Time:**

Received (Lab): EFT **Date:** 10/22/26 **Time:** 940

Comments/Special Instructions:

Page 1 of 2 pages

EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*: 042622365

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	~~HA~~ #	Sample Location	Material Description
TAB-10/20-	11BK	Corridor 110	Dry Wall & Joint Compound
-/-	12BK	Exterior	[redacted] Door/Window Caulk
- / -	13BK	Hall at Room 105 Township Manager	Carpet Mastic
- / -	14BK	Room 103 Administration	Carpet Mastic
- / -	15BK	Patrol Room 128	[redacted] 2x4 Ceiling Tile [redacted]
- / -	16BK	Corridor 119	[redacted] 2x2 CT (Textured)
- / -	17BK	Room 134 Police Secretary	Green Carpet Mastic
- / -	18BK	Patrol Room 128	DryWall Ceiling
- / -	19BK	Exterior	Roof Shingle
↓ - ↓ -	20BK	Exterior	Building Expansion Caulk (White)

***Comments/Special Instructions:**

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CINNAMINSON, NJ
2020 OCT 22 P 1:21

Page 2 of 2 pages

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042622372
Customer ID:	ELES42
Customer PO:	1574.0001
Project ID:	

Attention:	David Bertsch	**Phone:**	(717) 484-5111
	Element Environmental Solutions, Inc.	**Fax:**	
	61 Willow Street	**Received Date:**	10/22/2026 9:40 AM
	PO Box 921	**Analysis Date:**	10/26/2026
	Adamstown, PA 19501	**Collected Date:**	10/20/2026
Project:	District Court Building		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
DC-10/20-01BK *042622372-0001*	Court Room - 2x2 Ceiling Tile	Gray/White Fibrous Homogeneous	50% Cellulose 20% Min. Wool	10% Perlite 20% Non-fibrous (Other)	None Detected
DC-10/20-02BK-Drywall *042622372-0002*	Hallway Corrisor - Drywall	Brown/White Fibrous Homogeneous	10% Cellulose 5% Glass	65% Gypsum 20% Non-fibrous (Other)	None Detected
DC-10/20-02BK-Joint Compound *042622372-0002A*	Hallway Corrisor - Joint Compound	White Non-Fibrous Homogeneous		65% Ca Carbonate 35% Non-fibrous (Other)	None Detected
DC-10/20-03BK *042622372-0003*	Hallway Corrisor - Carpet Mastic (Green and Yellow)	Yellow/Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DC-10/20-04BK *042622372-0004*	Exterior - Door/Window Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
DC-10/20-05BK *042622372-0005*	Exterior - Roof Shingle	Black Fibrous Homogeneous	15% Glass	25% Quartz 60% Non-fibrous (Other)	None Detected

Analyst(s)
Megan Peters (6)

Samantha Sweeney

Samantha Sweeney, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 10/26/2026 23:29:14

OrderID: 042622372

EMSL ANALYTICAL, INC.
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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only*): 042622372

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

RECEIVED EMSL CINNAMINSON NJ 2026 OCT 22 P 1:17

Company : Element Environmental Solutions	**EMSL-Bill to:** ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: 61 Willow Street PO Box 921	
City: Adamstown **State/Province:** PA	**Zip/Postal Code:** 19501 **Country:** United States
Report To (Name): David Bertsch	**Telephone #:** 717-484-5111
Email Address: IAQ@e2s.us	**Fax #:** **Purchase Order:** 1574.0001
Project Name/Number: District Court Building	**Please Provide Results:** ☐ Fax ☑ Email ☐ Mail
U.S. State Samples Taken: PA	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour | ☐ 6 Hour | ☐ 24 Hour | ☒ 48 Hour | ☐ 72 Hour | ☐ 96 Hour | ☐ 1 Week | ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PLM - Bulk (reporting limit)	**TEM – Bulk**
☒ PLM EPA 600/R-93/116 (<1%)	☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ PLM EPA NOB (<1%)	☐ NY ELAP Method 198.4 (TEM)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ Chatfield Protocol (semi-quantitative)
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ NIOSH 9002 (<1%)	☐ TEM Qualitative via Filtration Prep Technique
☐ NY ELAP Method 198.1 (friable in NY)	☐ TEM Qualitative via Drop Mount Prep Technique
☐ NY ELAP Method 198.6 NOB (non-friable-NY)	**Other**
☐ OSHA ID-191 Modified	☐
☐ Standard Addition Method	

☐ **Check For Positive Stop – Clearly Identify Homogenous Group** **Date Sampled:** 10/20/2026

Samplers Name: Boston Patton **Samplers Signature:** Boston Patton

Sample #	PAVA #	Sample Location	Material Description
DC-10/20-01BK		Court room	2×2 Ceiling tile
"	02BK	Hallway corridor	Drywall + Joint Compound
"	03BK	Hallway corridor	Carpet Mastic (Green + Yellow)
"	04BK	Exterior	Door / Window Caulk
↓	05BK	Exterior	Roof Shingle

Client Sample # (s): - **Total # of Samples:** 5

Relinquished (Client): Boston Patton **Date:** 10/21/2026 **Time:**

Received (Lab): EFT **Date:** 10/22/26 **Time:** 940

Comments/Special Instructions:

OrderID: 042622372

EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

EMSL ANALYTICAL, INC.
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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number *(Lab Use Only)*:

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	HA #	Sample Location	Material Description

*Comments/Special Instructions:

Page _____ of _____ pages

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042622375
Customer ID:	ELES42
Customer PO:	1574.0001
Project ID:	

Attention:	David Bertsch	**Phone:**	(717) 484-5111
	Element Environmental Solutions, Inc.	**Fax:**	
	61 Willow Street	**Received Date:**	10/22/2026 9:40 AM
	PO Box 921	**Analysis Date:**	10/26/2026
	Adamstown, PA 19501	**Collected Date:**	10/20/2026
Project:	Service Garage		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
SG-10/20-01BK *042622375-0001*	Office - Light Brown Floor Tile 1'x1'	Brown Non-Fibrous Homogeneous		20% Quartz 80% Non-fibrous (Other)	None Detected
SG-10/20-02BK-Drywall *042622375-0002*	Bathroom - Drywall	Brown/Gray/White Fibrous Homogeneous	15% Cellulose	65% Gypsum 20% Non-fibrous (Other)	None Detected
SG-10/20-02BK-Joint Compound *042622375-0002A*	Bathroom - Joint Compound	White Non-Fibrous Homogeneous		65% Ca Carbonate 35% Non-fibrous (Other)	None Detected
SG-10/20-03BK *042622375-0003*	Bathroom - 2x4 Ceiling Tile	Gray/White Fibrous Homogeneous	50% Cellulose 20% Min. Wool	10% Perlite 20% Non-fibrous (Other)	None Detected
SG-10/20-04BK *042622375-0004*	Exterior - Building Expansion Caulk	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)
Megan Peters (5)

Samantha Sweeney

Samantha Sweeney, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 10/26/2026 23:27:52

OrderID: 042622375

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only*): 042622375

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

Company : Element Environmental Solutions	**EMSL-Bill to:** ☑ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: 61 Willow Street PO Box 921	
City: Adamstown **State/Province:** PA	**Zip/Postal Code:** 19501 **Country:** United States
Report To (Name): David Bertsch	**Telephone #:** 717-484-5111
Email Address: IAQ@e2s.us	**Fax #:** **Purchase Order:** 1574.0001
Project Name/Number: Service Garage	**Please Provide Results:** ☐ Fax ☑ Email ☐ Mail
U.S. State Samples Taken: PA	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PLM - Bulk (reporting limit)	TEM – Bulk
☒ PLM EPA 600/R-93/116 (<1%)	☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ PLM EPA NOB (<1%)	☐ NY ELAP Method 198.4 (TEM)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ Chatfield Protocol (semi-quantitative)
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ NIOSH 9002 (<1%)	☐ TEM Qualitative via Filtration Prep Technique
☐ NY ELAP Method 198.1 (friable in NY)	☐ TEM Qualitative via Drop Mount Prep Technique
☐ NY ELAP Method 198.6 NOB (non-friable-NY)	**Other**
☐ OSHA ID-191 Modified	☐
☐ Standard Addition Method	

RECEIVED EMSL CINNAMINSON NJ 2026 OCT 22 P 1:14

☐ **Check For Positive Stop – Clearly Identify Homogenous Group** **Date Sampled:** 10/20/2026

Samplers Name: Boston Patton **Samplers Signature:** Boston Patton

Sample #	HA #	Sample Location	Material Description
SG-10/20	-01BK	Office	Light Brown floor tile 1'x1'
"	-02BK	Bathroom	Drywall + JC
"	-03BK	Bathroom	2 x 4 Ceiling tile
"	-04BK	Exterior	Building expansion Caulk

Client Sample # (s): - **Total # of Samples:** 4

Relinquished (Client): Boston Patton **Date:** 10/21/2026 **Time:**

Received (Lab): FF+ **Date:** 10/22/26 **Time:** 940

Comments/Special Instructions:

Page 1 of 1 pages

4

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:cs@emsl.com
www.emsl.com

EMSL Order ID: 012641416
LIMS Reference ID: AE41416
EMSL Customer ID: ELES42

Attention: Dave Bertsch
Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: Township Admin Building

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:40
Reported: 10/26/2026 18:03

Analytical Results

Analyte	Results	RL	Weight	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: TAB 10/20 - 01PC/Throughout - Door Frame								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41416-01**	
Lead	0.013 % wt	0.0064 % wt	0.2758 g	10/23/26 TJ	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: TAB 10/20 - 02PC/Throughout - Wall Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41416-02**	
Lead	<0.0068 % wt	0.0068 % wt	0.2338 g	10/23/26 TJ	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: TAB 10/20 - 03PC/Throughout - Block Wall Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41416-03**	
Lead	<0.018 % wt	0.018 % wt	0.0907 g	10/23/26 TJ	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: TAB 10/20 - 04PC/Exterior - Wood Components								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41416-04**	
Lead	<0.0064 % wt	0.0064 % wt	0.2482 g	10/23/26 TJ	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: TAB 10/20 - 05PC/Exterior - Shutter Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41416-05**	
Lead	0.27 % wt	0.0066 % wt	0.2421 g	10/23/26 TJ	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1

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EMSL Order ID: 012641416
LIMS Reference ID: AE41416
EMSL Customer ID: ELES42

Attention: Dave Bertsch
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61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: Township Admin Building

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:40
Reported: 10/26/2026 18:03

Certified Analyses included in this Report

Analyte	Certifications
SW846-7000B in Chips	
Lead	AIHA LAP

List of Certifications

Code	Description	Number	Expires
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2027
AIHA LAP	American Industrial Hygiene Association (AIHA LAP, LLC)	100194	04/01/2027
NYSDOH	New York State Department of Health ELAP	10872	04/01/2027
California ELAP	California Water Boards	1877	06/30/2027
A2LA	A2LA Environmental Certificate	2845.01	07/31/2028
21-A2LA	A2LA Food Chem/Mat Sci	2845.15	07/31/2028
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2026
HIDOH	Hawaii Department of Health	HI via NJ 03036	06/30/2027
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2027
CTDPH	Connecticut Department of Public Health	PH-0270	06/30/2028

Please see the specific Field of Testing (FOT) on www.emsl.com <http://www.emsl.com> for a complete listing of parameters for which EMSL is certified.

Notes and Definitions

Item	Definition
D	Analyte was reported from a dilution run.
Pb7	The RLVS recovery for Lead was outside of the method control limits.
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DA	Direct Analysis
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the reporting limit, or the mdl if provided.
NR	Spike/Surrogate showed no recovery.
Q	Qualifier
RCS	Respirable Crystalline Silica
RL	Reporting Limit For paint chips, the RL is 0.0064% by wt. (equiv. to 64 mg/kg, or ppm) based upon a minimum sample weight of 0.25 grams. For soils, the RL is 32 mg/kg (ppm) based upon a minimum sample weight of 0.5 grams. For dust wipes, the RL is 8 µg/wipe; reporting units of µg/sq. ft. are not validated by the lab based upon data provided by non-lab personnel.
Wet	Sample is not dry weight corrected.

EMSL Analytical, Inc.

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EMSL Order ID: 012641416
LIMS Reference ID: AE41416
EMSL Customer ID: ELES42

Attention: Dave Bertsch
Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: Township Admin Building

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:40
Reported: 10/26/2026 18:03

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

Owen McKenna Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. QC sample results are within quality control criteria and met method specifications unless otherwise noted. All results for soil samples are reported on a dry weight basis, unless otherwise noted.

Analysis following EMSL SOP for the Determination of Environmental Lead by FLAA. The laboratory has a reporting limit of 0.0064% by wt., based upon a minimum sample weight of 0.25g submitted to the lab, and is not responsible for any result or reporting limit provided in mg/cm2 since it is dependent upon an area value provided by non-lab personnel. A "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty and definitions of modifications are available upon request. Results in this report are not blank corrected unless specified.

EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

EMSL ANALYTICAL, INC.
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Lead (Pb) Chain of Custody

EMSL Order ID *(Lab Use Only):* AE41416

Company : Element Environmental Solutions, Inc.	**EMSL-Bill to:** ☐ Different ☑ Same If Bill to is Different note instructions in Comments**
Street: 61 Willow Street P.O. Box 921	*Third Party Billing requires written authorization from third party*
City: Adamstown **State/Province:** PA	**Zip/Postal Code:** 19501 **Country:** United States
Report To (Name): Dave Bertsch	**Telephone #:** 717-484-5111
Email Address: IAQ@e2s.us	**Fax #:** **Purchase Order:** 1574.000
Project Name/Number: Township Admin Building	**Please Provide Results:** ☐ FAX ☑ E-mail ☐ Mail
U.S. State Samples Taken: PA	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide

Matrix	Method	Instrument	Reporting Limit	Check
Chips ☒ % by wt. ☐ mg/cm² ☐ ppm	SW846-7000B	Flame Atomic Absorption	0.01%	☒
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	☐
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	☐
	NIOSH 7300 modified	ICP-AES/ICP-MS	0.5 µg/filter	☐
Wipe* ASTM ☐ non ASTM ☐ *if no box is checked, non-ASTM Wipe is assumed	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	☐
	SW846-6010B or C	ICP-AES	1.0 µg/wipe	☐
	SW846-7000B/7010	Graphite Furnace AA	0.075 µg/wipe	☐
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW846-1131/SW846-6010B or C	ICP-AES	0.1 mg/L (ppm)	☐
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	☐
	SW846-7010	Graphite Furnace AA	0.3 mg/kg (ppm)	☐
	SW846-6010B or C	ICP-AES	2 mg/kg (ppm)	☐
Wastewater Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.7	ICP-AES	0.020 mg/L (ppm)	☐
Drinking Water Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-AES	12 µg/filter	☐
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	☐
Other:				☐

Name of Sampler: Boston Patton **Signature of Sampler:** Boston Patton

Sample #	Location/Component	~~Volume/Area~~	Date/Time Sampled
TAB-10/20-01PC	Throughout - Door Frame (Composite)		10/20
" - 02PC	Throughout - Wall Paint (Composite)		"
" - 03PC	Throughout - Block Wall Paint (Composite)		"
" - 04PC	Exterior - Wood Components (Composite)		"
" - 05PC	Exterior - Shutter Paint (Composite)		"

Client Sample #'s - **Total # of Samples:** 5

Relinquished (Client):	Boston Patton	**Date:**	10/21/20	**Time:**	
Received (Lab):	[illegible] EPT	**Date:**	10/22/20	**Time:**	1140

Comments:

RECEIVED OCT 22 2020 EMSL

EMSL ANALYTICAL, INC.
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EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

LEAD (Pb) CHAIN OF CUSTODY

EMSL ORDER ID *(Lab Use Only):*

AE41416

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Location	Volume/Area	Date/Time Sampled

Comments/Special Instructions:

Page _____ of _____ pages

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:cs@emsl.com
www.emsl.com

EMSL Order ID: 012641406
LIMS Reference ID: AE41406
EMSL Customer ID: ELES42

Attention: Dave Bertsch
Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: District Court Building

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:35
Reported: 10/26/2026 18:05

Analytical Results

Analyte	Results	RL	Weight	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: DCB - 10/20-01PC/Throughout- Door Frame								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41406-01**	
Lead	<0.015 % wt	0.015 % wt	0.1092 g	10/23/26 lxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: DCB - 10/20 -02PC/Throughout - Wall Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41406-02**	
Lead	<0.0064 % wt	0.0064 % wt	0.2601 g	10/23/26 lxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: DCB - 10/20 -03PC/Throughout - Window Frame								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41406-03**	
Lead	<0.0064 % wt	0.0064 % wt	0.2639 g	10/23/26 lxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: DCB - 10/20 -04PC/Exterior - Wood Components								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41406-04**	
Lead	<0.0066 % wt	0.0066 % wt	0.2409 g	10/23/26 lxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:cs@emsl.com
www.emsl.com

EMSL Order ID: 012641406
LIMS Reference ID: AE41406
EMSL Customer ID: ELES42

Attention: Dave Bertsch
Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: District Court Building
Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:35
Reported: 10/26/2026 18:05

Certified Analyses included in this Report

Analyte	Certifications
SW846-7000B in Chips	
Lead	AIHA LAP

List of Certifications

Code	Description	Number	Expires
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2027
AIHA LAP	American Industrial Hygiene Association (AIHA LAP, LLC)	100194	04/01/2027
NYSDOH	New York State Department of Health ELAP	10872	04/01/2027
California ELAP	California Water Boards	1877	06/30/2027
A2LA	A2LA Environmental Certificate	2845.01	07/31/2028
21-A2LA	A2LA Food Chem/Mat Sci	2845.15	07/31/2028
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2026
HIDOH	Hawaii Department of Health	HI via NJ 03036	06/30/2027
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2027
CTDPH	Connecticut Department of Public Health	PH-0270	06/30/2028

Please see the specific Field of Testing (FOT) on www.emsl.com <http://www.emsl.com> for a complete listing of parameters for which EMSL is certified.

Notes and Definitions

Item	Definition
Pb7	The RLVS recovery for Lead was outside of the method control limits.
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DA	Direct Analysis
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the reporting limit, or the mdl if provided.
NR	Spike/Surrogate showed no recovery.
Q	Qualifier
RCS	Respirable Crystalline Silica
RL	Reporting Limit For paint chips, the RL is 0.0064% by wt. (equiv. to 64 mg/kg, or ppm) based upon a minimum sample weight of 0.25 grams. For soils, the RL is 32 mg/kg (ppm) based upon a minimum sample weight of 0.5 grams. For dust wipes, the RL is 8 µg/wipe; reporting units of µg/sq. ft. are not validated by the lab based upon data provided by non-lab personnel.
Wet	Sample is not dry weight corrected.

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:cs@emsl.com
www.emsl.com

EMSL Order ID: 012641406
LIMS Reference ID: AE41406
EMSL Customer ID: ELES42

Attention: Dave Bertsch
Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: District Court Building

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:35
Reported: 10/26/2026 18:05

Owen McKenna Laboratory Manager or other approved signatory

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Analysis following EMSL SOP for the Determination of Environmental Lead by FLAA. The laboratory has a reporting limit of 0.0064% by wt., based upon a minimum sample weight of 0.25g submitted to the lab, and is not responsible for any result or reporting limit provided in mg/cm2 since it is dependent upon an area value provided by non-lab personnel. A "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty and definitions of modifications are available upon request. Results in this report are not blank corrected unless specified.

EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

EMSL ANALYTICAL, INC.
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Lead (Pb) Chain of Custody

EMSL Order ID *(Lab Use Only):* AE41406

Company: Element Environmental Solutions, Inc.	**EMSL-Bill to:** ☐ Different ☑ Same If Bill to is Different note instructions in Comments**
Street: 61 Willow Street P.O. Box 921	*Third Party Billing requires written authorization from third party*
City: Adamstown **State/Province:** PA	**Zip/Postal Code:** 19501 **Country:** United States
Report To (Name): Dave Bertsch	**Telephone #:** 717-484-5111
Email Address: IAQ@e2s.us	**Fax #:** **Purchase Order:** 1574.0001
Project Name/Number: District Court Building	**Please Provide Results:** ☐ FAX ☑ E-mail ☐ Mail
U.S. State Samples Taken: PA	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide

Matrix	Method	Instrument	Reporting Limit	Check
Chips ☒ % by wt. ☐ mg/cm² ☐ ppm	SW846-7000B	Flame Atomic Absorption	0.01%	☒
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	☐
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	☐
	NIOSH 7300 modified	ICP-AES/ICP-MS	0.5 µg/filter	☐
Wipe* ASTM ☐ non ASTM ☐ *if no box is checked, non-ASTM Wipe is assumed	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	☐
	SW846-6010B or C	ICP-AES	1.0 µg/wipe	☐
	SW846-7000B/7010	Graphite Furnace AA	0.075 µg/wipe	☐
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW846-1131/SW846-6010B or C	ICP-AES	0.1 mg/L (ppm)	☐
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	☐
	SW846-7010	Graphite Furnace AA	0.3 mg/kg (ppm)	☐
	SW846-6010B or C	ICP-AES	2 mg/kg (ppm)	☐
Wastewater Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.7	ICP-AES	0.020 mg/L (ppm)	☐
Drinking Water Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-AES	12 µg/filter	☐
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	☐
Other:				☐

Name of Sampler: [redacted] Boston Patton **Signature of Sampler:** [redacted] Boston Patton

Sample #	Location / Component	~~Volume/Area~~	Date/Time Sampled
DCB-10/20-01PC	Throughout - Door Frame (Composite)		10/20
" - " -02PC	Throughout - Wall Paint (Composite)		
" - " -03PC	Throughout - Window Frame (Composite)		
↓ - ↓ -04PC	Exterior - Wood Components (Composite)		

Client Sample #'s - **Total # of Samples:** 4

Relinquished (Client):	[redacted] Boston Patton	**Date:**	10/21/20	**Time:**	
Received (Lab):	[redacted] EFT	**Date:**	10/22/20	**Time:**	1135

Comments:

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

LEAD (Pb) CHAIN OF CUSTODY

EMSL ORDER ID *(Lab Use Only):*

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Location	Volume/Area	Date/Time Sampled

Comments/Special Instructions:

Page _____ of _____ pages

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:cs@emsl.com
www.emsl.com

EMSL Order ID: 012641410
LIMS Reference ID: AE41410
EMSL Customer ID: ELES42

Attention: Dave Bertsch
Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: Service Garage

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:40
Reported: 10/26/2026 18:04

Analytical Results

Analyte	Results	RL	Weight	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: SG - 10/20 - 01PC/Throughout - Door Frame Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41410-01**	
Lead	<0.0073 % wt	0.0073 % wt	0.2187 g	10/23/26 IxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: SG - 10/20 - 02PC/Throughout - Block Wall Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41410-02**	
Lead	<0.0064 % wt	0.0064 % wt	0.2544 g	10/23/26 IxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: SG - 10/20 - 03PC/Exterior - Block Wall Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41410-03**	
Lead	<0.0064 % wt	0.0064 % wt	0.2645 g	10/23/26 IxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1
Client Sample ID: SG - 10/20 - 03PC/Exterior - Garage Door/Frame Paint								**Date Sampled: 10/20/26**	
Matrix: Chips								**LIMS Reference ID: AE41410-04**	
Lead	<0.0070 % wt	0.0070 % wt	0.2272 g	10/23/26 IxW	SW-846 3050B	10/26/26 PMx	SW846-7000B	Pb7	1

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Telephone: 856-858-4800 Fax:cs@emsl.com
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Element Environmental Solutions, Inc. [ELES42]
61 Willow Street, PO Box 921
Adamstown, PA 19501
(717) 484-5111
IAQ@e2s.us

Project Name: Service Garage

Customer PO:
EMSL Sales Rep: John LaFleur
Received: 10/22/2026 11:40
Reported: 10/26/2026 18:04

Certified Analyses included in this Report

Analyte	Certifications
SW846-7000B in Chips	
Lead	AIHA LAP

List of Certifications

Code	Description	Number	Expires
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2027
AIHA LAP	American Industrial Hygiene Association (AIHA LAP, LLC)	100194	04/01/2027
NYSDOH	New York State Department of Health ELAP	10872	04/01/2027
California ELAP	California Water Boards	1877	06/30/2027
A2LA	A2LA Environmental Certificate	2845.01	07/31/2028
21-A2LA	A2LA Food Chem/Mat Sci	2845.15	07/31/2028
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2026
HIDOH	Hawaii Department of Health	HI via NJ 03036	06/30/2027
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2027
CTDPH	Connecticut Department of Public Health	PH-0270	06/30/2028

Please see the specific Field of Testing (FOT) on www.emsl.com <http://www.emsl.com> for a complete listing of parameters for which EMSL is certified.

Notes and Definitions

Item	Definition
Pb7	The RLVS recovery for Lead was outside of the method control limits.
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DA	Direct Analysis
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the reporting limit, or the mdl if provided.
NR	Spike/Surrogate showed no recovery.
Q	Qualifier
RCS	Respirable Crystalline Silica
RL	Reporting Limit For paint chips, the RL is 0.0064% by wt. (equiv. to 64 mg/kg, or ppm) based upon a minimum sample weight of 0.25 grams. For soils, the RL is 32 mg/kg (ppm) based upon a minimum sample weight of 0.5 grams. For dust wipes, the RL is 8 µg/wipe; reporting units of µg/sq. ft. are not validated by the lab based upon data provided by non-lab personnel.
Wet	Sample is not dry weight corrected.

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

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Received: 10/22/2026 11:40
Reported: 10/26/2026 18:04

Owen McKenna Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. QC sample results are within quality control criteria and met method specifications unless otherwise noted. All results for soil samples are reported on a dry weight basis, unless otherwise noted.

Analysis following EMSL SOP for the Determination of Environmental Lead by FLAA. The laboratory has a reporting limit of 0.0064% by wt., based upon a minimum sample weight of 0.25g submitted to the lab, and is not responsible for any result or reporting limit provided in mg/cm2 since it is dependent upon an area value provided by non-lab personnel. A "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty and definitions of modifications are available upon request. Results in this report are not blank corrected unless specified.

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Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

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Lead (Pb) Chain of Custody

EMSL Order ID *(Lab Use Only):* AE41410

Company : Element Environmental Solutions, Inc.	**EMSL-Bill to:** ☐ Different ☑ Same If Bill to is Different note instructions in Comments**
Street: 61 Willow Street P.O. Box 921	*Third Party Billing requires written authorization from third party*
City: Adamstown **State/Province:** PA	**Zip/Postal Code:** 19501 **Country:** United States
Report To (Name): Dave Bertsch	**Telephone #:** 717-484-5111
Email Address: IAQ@e2s.us	**Fax #:** **Purchase Order:** 1574.001
Project Name/Number: Service Garage	**Please Provide Results:** ☐ FAX ☑ E-mail ☐ Mail
U.S. State Samples Taken: PA	**CT Samples:** ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

**Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide*

Matrix	Method	Instrument	Reporting Limit	Check
Chips ☒ % by wt. ☐ mg/cm² ☐ ppm	SW846-7000B	Flame Atomic Absorption	0.01%	☒
Air	NIOSH 7082	Flame Atomic Absorption	4 µg/filter	☐
	NIOSH 7105	Graphite Furnace AA	0.03 µg/filter	☐
	NIOSH 7300 modified	ICP-AES/ICP-MS	0.5 µg/filter	☐
Wipe* ASTM ☐ non ASTM ☐ *if no box is checked, non-ASTM Wipe is assumed	SW846-7000B	Flame Atomic Absorption	10 µg/wipe	☐
	SW846-6010B or C	ICP-AES	1.0 µg/wipe	☐
	SW846-7000B/7010	Graphite Furnace AA	0.075 µg/wipe	☐
TCLP	SW846-1311/7000B/SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW846-1131/SW846-6010B or C	ICP-AES	0.1 mg/L (ppm)	☐
Soil	SW846-7000B	Flame Atomic Absorption	40 mg/kg (ppm)	☐
	SW846-7010	Graphite Furnace AA	0.3 mg/kg (ppm)	☐
	SW846-6010B or C	ICP-AES	2 mg/kg (ppm)	☐
Wastewater Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	SM3111B/SW846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.7	ICP-AES	0.020 mg/L (ppm)	☐
Drinking Water Unpreserved ☐ Preserved with HNO_3 pH < 2 ☐	EPA 200.9	Graphite Furnace AA	0.003 mg/L (ppm)	☐
	EPA 200.8	ICP-MS	0.004 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-AES	12 µg/filter	☐
	40 CFR Part 50	Graphite Furnace AA	3.6 µg/filter	☐
Other:				☐

Name of Sampler: Boston Patton **Signature of Sampler:** Boston Patton

Sample #	Location/Component	~~Volume/Area~~	Date/Time Sampled
SG-10/20-01PC	Throughout - Door Frame Paint (Composite)		10/20
-02PC	Throughout - Block Wall Paint (Composite)		↓
-03PC	Exterior - Block Wall Paint (Composite)		
-04PC	Exterior - Garage Door/Frame Paint (Composite)		

Client Sample #'s - **Total # of Samples:** 4

Relinquished (Client):	Boston Patton	**Date:**	10/21/26	**Time:**	
Received (Lab):	EPT	**Date:**	10/22/26	**Time:**	1110

Comments:

EMSL ANALYTICAL, INC.
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EMSL Analytical, Inc.
200 Route 130 North

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

LEAD (Pb) CHAIN OF CUSTODY

EMSL ORDER ID *(Lab Use Only):*

AE41410

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Location	Volume/Area	Date/Time Sampled

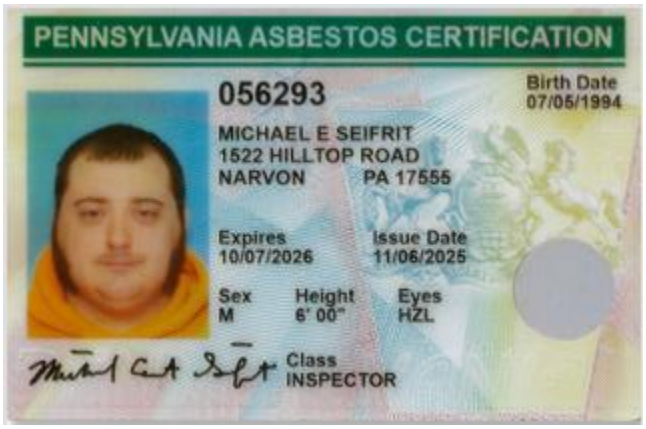
Comments/Special Instructions:

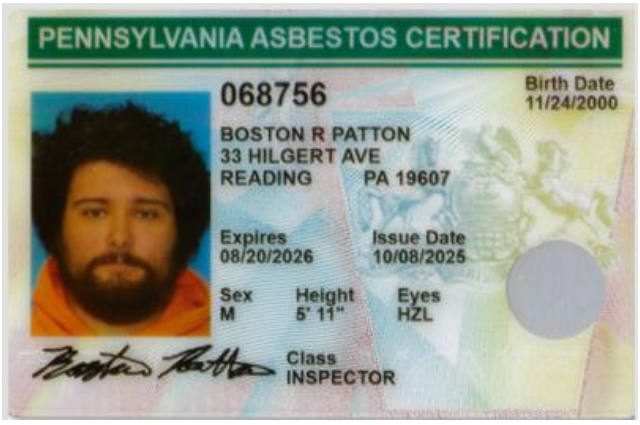
Page _____ of _____ pages

Appendix B

Accreditations

Asbestos Building Inspector Certifications





SECTION 02 2600 - REMOVAL OF ASBESTOS CONTAINING MATERIALS

PART 1 - GENERAL

1.01 STIPULATIONS

A. The procedures specified herein are guidelines for minimum performance. The Contractor is responsible for his own methods of operations and conformance to regulatory codes, rules and guidelines. The Contractor is required to obtain all permits, licenses and approvals to perform the work, including any rights to use patented systems.

B. Asbestos Project Designer:

Name: _ _____

PA L&I Certification No. _____

1.02 SCOPE OF WORK

A. The scope of work for this project covers the supplying of all labor, tools, materials, equipment, services and appurtenances to accomplish the work specified and indicated on the contract drawing. The work shall be performed to the complete satisfaction of the Owner in accordance with the current EPA and OSHA regulations, State Labor and Industry and Owner of Environment Protection regulations and any other applicable State and Local Government regulations.

B. Contractor shall submit an Action Plan which describes specifically how abatement work is to be completed for each abatement phase. At a minimum the work Plan shall address work area preparation, work practices, decon location, estimated completion dates, respiratory protection, and disposal. Approval of the Action Plan must be obtained through the Professional prior to the start of work. Procedures outlined in the Action Plan must be followed throughout the abatement phase. Any changes in Action Plan must obtain prior approval from Professional.

C. Work under this project includes but is not limited to the following:
1. *12”x12” Beige Floor tile and associated mastic in the Admin Building, located under the existing carpet tile in “Corridor C-5 on the new Floor Plan, outside of Offices 104, 105, and down towards Twp Admin office 103) only (approx. 112 SF)*

Note: Please reference E2S report dated October 29, 2026 for inspection details.

D. Abatement Contractor is to coordinate all work with the General Contractor

1.03 CONTROL OF WORK

A. All work which does not conform to the requirements of the contract, plans and specifications will be considered unacceptable.

B. Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be corrected immediately and replaced in an acceptable manner.

C. All bidders should inspect job site prior to bidding to determine job conditions.

D. If the Owner finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or material shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

E. The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the plans, contract and specifications. The term shall not be construed as waiving the Owner's right to insist on strict compliance with the requirements of the contract, plans and specifications during the Contractor's prosecution of the work, when in the Owner's opinion and judgement such compliance is essential to provide an acceptable finished work.

1.04 QUALITY ASSURANCE

A. Consultant:

1) The Professional shall contract for a Quality Assurance Consultant Project Monitor hereafter referred to as ‘Consulting Firm’ which specializes in performing air sampling, project monitoring and inspections on asbestos abatement projects. The testing laboratory shall as a minimum be accredited by the NIOSH PAT Program (Proficiency Analytical Testing) for PCM asbestos air analysis, and NVLAP for asbestos bulk analysis.

2) The Consulting Firm will be responsible for certifying the project was completed in accordance with all federal, state, and local asbestos standards and regulations.

3) The Consulting Firm and Asbestos Abatement Contractor must complete the Certification of Visual Inspection form found at the end of this section for each work area completed.

4) The Consulting Firm shall review the Contractors Action Plan which describes specifically how work is to be completed for each abatement phase. Approval of the Action Plan must be obtained through the Professional prior to the start of work.

B. Contractor Experience:

1) The Asbestos Abatement Contractor shall have a minimum of three (3) years experience in the asbestos abatement business. He shall have successfully completed three (3) projects of similar or larger size and dollar value to this project and shall not have defaulted on an asbestos abatement project within the last three (3) years. The Contractor shall be certified by Pennsylvania Owner of Labor and Industry.

C. Worker Certification:

1) The Contractor shall furnish proof that his employees have had instruction on the dangers of asbestos exposure, on respirator use, decontamination and current OSHA and EPA regulations.

2) Documentation of workers medical exams, consist of x-rays and pulmonary function shall be submitted and as may be required by current OSHA and EPA regulations and any applicable State and Local Government regulations.

3) There must be on site at all times, an EPA Certified Asbestos Abatement Supervisor. The Asbestos Abatement Supervisor shall have successfully completed a 5-day EPA Certified Practices and Procedures Course as per 40 CFR, Part 763, Subpart E, Appendix C-EPA Model Accreditation Plan (must provide a copy of certificate from EPA approved course). All asbestos workers shall have successfully completed a 4-day EPA Certified Practices and Procedures Course as per 40 CFR, Part 763, Subpart E, Appendix C-EPA Model Accreditation Plan. The Contractor must provide copies of certificates from Pennsylvania Owner of Labor and Industry for all workers, and supervisors as required by regulation.

4) When required by the Pennsylvania Owner of Labor and Industry (PDL&I) the Contractor, Abatement Supervisor, and Abatement Workers shall be licensed by (PDL&I). Each worker/supervisor shall have a current photo identification issued by PDL&I available on request by the Owner when required.

1.05 POSTING OF REGULATIONS

A. The Contractor will have at all times in his possession at his office one (1) copy and in view at the job site one (1) copy, current OSHA Regulations 29 CFR 1926.1101, Asbestos and current Environmental Protection Agency 40 CFR Part 61, Subpart M: National Emission Standard for Hazardous Air Pollutants as related to asbestos stripping, emissions, notification, work practices and disposal of asbestos waste.

1.06 REGULATORY SUBMITTALS (CONTRACTOR'S RESPONSIBILITY)

The Contractor is required to notify the building occupants and the following agencies in writing ten (10) days prior to starting work for notification and instructions concerning proper disposal of asbestos waste material.

1) United States Environmental Protection Agency - Region III
Asbestos - NESHAP Coordinator (3AT33)
841 Chestnut Building
Philadelphia, PA 19106

2) Pennsylvania Owner of Environmental Protection
Bureau of Air Quality Control

Regional Manager

3) Pennsylvania Owner of Labor and Industry
Asbestos Occupation Accreditations & Certification
Bureau of Occupational and Industrial Safety
Room 1623 Labor and Industry Building
Seventh & Forster Streets
Harrisburg, Pennsylvania 17120

4) Where work is performed in Allegheny County or City of Philadelphia, appropriate notification must also be made. Obtain permits as required by local regulations.

5) EPA, DEP approved asbestos landfill proposed to be used by the Contractor for RACM. Submit completed WSR for RACM at projects end (see 3.07, F).

1.07 AIR TESTING AND MONITORING

A. Air sampling of the work areas and surrounding environment will be conducted during the performance of this contract by the Consulting Firm so as to ensure abatement procedures are in compliance with all codes, regulations, ordinances and this specification.

B. The Contractor shall fully cooperate with the Consulting Firm and all others responsible for testing and inspecting the work.

C. Air testing and analyses shall be in accordance with current EPA and requirements of Section 29 CFR 1926.1101 of the current OSHA Regulations, as a minimum. Analysis shall be performed by Phase Contrast Microscopy per NIOSH 7400 Method and/or Transmission Electron Microscopy (TEM) per EPA Level II (AHERA) analytical procedures.

D. Air tests taken prior to start of work (background) and at completion (pre-clearance) will be analyzed by PCM-Phase Contrast Microscopy. Final (clearance) testing shall be by TEM-Transmission Electron Microscopy.

E. The Consulting Firm shall give verbal notification to the Owner of the results of each test within twenty-four (24) hours of the time the samples were delivered to the laboratory. The Consulting Firm shall confirm the results in writing within three (3) days thereafter. A microscope on site for PCM analyses is acceptable to facilitate a faster turn-around time.

F. Prompt reports are necessary so that, if required, modifications to work methods and/or practices may be implemented as soon as possible.

G. Representatives of the Consulting Firm shall have access to the work area at all times. The Contractor shall provide facilities for such access in order that the Consulting Firm may properly perform its function.

H. Sampling equipment and personnel will be provided by the Consulting Firm.

I. Air sampling shall be performed in each work area prior to commencement of the work at that location. The highest fiber count reading during pre-clearance clean-up monitoring shall be lower than the background readings established by pre-job

monitoring or 0.01 f/cc, whichever is lower. When the criteria is met, perform final clearance testing by Transmission Electron Microscopy (TEM) using EPA Level II methodology. Clearance criteria is 70 s/mm^2 for fibers greater than .5 microns in length with an aspect ratio 5:1.

J. Air samples shall be taken in accordance with, but not necessarily limited to, the following schedule:

AREA	WHEN	NUMBER	MINIMUM VOLUME (liters)	FLOW RATE (liters/min.)
Work Area(PCM)	Prior to job start	2	1500	2-10
Work Area(PCM)	During area isolation	Daily$_1$	480-960	1-2
Work Area-Inside (PCM)	During abatement work	Daily$_1$	480-960	1-2
Work area Exterior (PCM)$_2$	During abatement work	Daily$_1$	1000	2-10
Work Area(PCM)$_4$	Upon work(pre-clearance)completion	2(minimum)	1500	2-10
Work Area (TEM)$_4$	At completion (final)	1$_3$	1200	2-10

SCHEDULE NOTES:

1 Consecutive daily air samples will be collected during abatement to yield a minimum of eight (8) hours of sampling time for each active work area.

2 Exterior work area(s) samples shall be collected daily at decon clean room entrance, load out exit, discharge of HEPA exhaust units, and area(s) adjacent to work area(s) that are occupied or will be re-occupied.

3 One sample collected and analyzed per work area; archive remaining filter for one year.

4. Aggressive air sampling must be conducted when work area is prepared as a negative pressure enclosure.

K. Work area clearance testing shall be completed before work site protective barriers are removed.

L. The Contractor is responsible for performing the thirty (30) minute excursion air sampling per OSHA regulations.

M. The Contractor is responsible for performing 8 hour TWA personal air samples in the employees breathing zone per OSHA regulations.

1.08 AIR FILTERING - (FOR GUIDELINE PURPOSES ONLY)

A. An approved negative pressure machine may be used in the active work area using HEPA equipped air movement units.

B. Air may be drawn from clean areas through the decontamination and active work areas, HEPA filtered and exhausted through air movement units to the containment exterior. Replace filters in accordance with manufacturer's instructions and to meet the needs of this specification.

C. Air movement should be sufficient quantity to ensure a minimum of four (4) air changes per hour.

Example: Active work area = 50' x 50' x 20' H = 50,000 cu. ft.

For four air changes per hour = 4 AC/HR x 50,000 CF/AC = 200,000 cu.ft./hr.

In cubic feet per minute = 200,000 CF/HR : 60 min/hr = 3,333 cu. ft./minute

This active work area would require a combination of air movement/HEPA units, i.e., 2,500 CFM and 1,500 CFM

D. The exhaust system must be sufficient to maintain a minimum pressure differential of -0.02 inches of water relative to unsealed, adjacent area. Provide continuous, twenty-four (24) hours per day monitoring of the pressure differential with an automatic recording instrument.

E. The exhaust system(s) will run twenty-four (24) hours/day until final clearance is obtained and will be maintained in accordance with ANSI Z9.2 and the manufacturers directions.

F. To ensure continuous operation, the Contractor shall have a spare negative exhaust unit available.

1.09 ALTERNATIVE AIR FILTERING METHODS

A. Other approved air filtering methods may be utilized at the Contractor's discretion, with the stipulation that designated regulatory agencies provide documented approval to the Owner. It shall be the responsibility of the Contractor to submit all documentation required to the appropriate regulatory agency for their review and approval.

1.10 PLACEMENT OF WARNING SIGNS AND LABELS

A. The Contractor shall furnish and place warning signs at all approaches to asbestos control areas containing concentrations of airborne asbestos fibers. Locate warning signs at such a distance that personnel may read the warning sign and take the necessary protective action required before entering the area. Warning signs shall be in place for the duration of the work. The Contractor shall furnish and attach caution labels to all disposal containers holding asbestos materials, scrap waste, debris and other products contaminated with asbestos.

B. Warning Signs: Provide warning signs conforming to 29 CFR 1926.1101 with the following legend:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE CLOTHING ARE
REQUIRED IN THIS AREA

C. Caution Labels: Attach label to the outside of all disposal bags and containers which hold asbestos contaminated materials and are to be removed from the site. Caution labels shall be printed in letters of sufficient size and contrast so as to be readily visible and legible and shall display the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

D. Identification Labels: Attach label to the outside of all disposal bags and containers which hold asbestos contaminated materials and are to be transported off facility site. Identification labels shall display the following legend:

Waste Generator Name: _____Fill Out_____

Generator Location: _____Fill Out_____

E. Transportation marking shall conform to 49 CFR 171 and 172 and shall be provided on all containers with more than one pound of friable asbestos. Transportation marking shall display the following legend:

R Q HAZARDOUS SUBSTANCE
SOLID, NOS
ORM-E, NA 9188
(ASBESTOS)

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. The list of required materials will include, but is not necessarily limited to the following:

1) Respirators: Provide respiratory protection in accordance with OSHA Regulation 29 CFR 1926.1101 and appendices ANSI Z88.2-1980. Respiratory protection regardless of negative exposure assessments. There shall be NO EXCEPTION to this requirement. As minimum protection, negative pressure air purifying respirators shall be worn. Contractor shall select the appropriate respirator based on an initial exposure assessment or exposure monitoring results. No employee or visitor shall enter any area without this protection until clearance has been obtained. Employees or visitors shall wear a respirator. Respirators shall be NIOSH approved. Ensure proper filters are worn using a HEPA as a minimum.

2) Protective Clothing:

a) Disposable Clothing – such as "Tyvek" by DuPont. Clothing shall consist of coverall, head cover and foot cover. Gloves will be worn for hand cover as needed.

3) Wetting Agents - The asbestos material will be sprayed with water containing an additive to enhance penetration. The additive, or wetting agent, will be polyoxyethylene at a concentration of one (1) ounce per five (5) gallons of water or as otherwise specified by manufacturer. A fine spray of this solution must be applied to prevent fiber disturbance proceeding the removal of the asbestos material. The asbestos will be sufficiently saturated to prevent emission of airborne fibers in excess of the exposure limits prescribed in the current OSHA standards referenced in these specifications. DRY REMOVAL WILL NOT BE ALLOWED EXCEPT WITH WRITTEN APPROVAL FROM EPA or BECAUSE OF FREEZING WORK AREA TEMPERATURES.

4) Polyethylene sheeting: Six (6) mils, for protection of floors, walls, doors, windows, fixed equipment, HVAC supply and return openings, and critical barriers.

5) Polyethylene bags (with warning labels) six (6) mils minimum for disposal. All asbestos that is removed shall be double bagged.

6) Tape: High quality vinyl or fabric duct tape. Paper masking tape will not be permitted.

7) Negative Pressure Filtration Equipment: Air movement and filtering equipment equipped with HEPA filters rated at 99.97% removal down to 0.3 microns, and of sufficient capacity to provide a minimum of four (4) air changes per hour for each active work area.

8) Airless Spray Equipment: Electric airless spray equipment for saturating and mist fiber control. Low pressure (500 psi) equipment must be available on-site and utilized as required.

9) Vacuum: HEPA rated for surface cleaning and house-keeping. Hand operated and power tools such as, but not limited to, saws, corers, abrasive wheels and drills should be provided with local exhaust ventilation systems with HEPA filters.

10) Hand Tools: Brooms, plastic shovels, scrapers, brushes, etc., in sufficient quantity to ensure the appropriate level of housekeeping.

11) Water Filtration System: Shower and contaminated water filtration system.

12) GFI Equipment: All electrical connections in the work area must be through "ground fault" protected outlets/circuits.

13) Penetrating Encapsulant: Penetrating encapsulants to be used on this project are International Cellulose Corporation SK-13 Asbestos Encapsulant, International Protective Coatings Corporation Serpiflex Shield, Fiberlock Technology ABC Asbestos Binding Compound Concentrate, and others listed as acceptable in the Environmental Protection Agency - Battelle Laboratory Encapsulant Study, or approved equal.

14) Bridging Encapsulant: Bridging encapsulants to be used on this project are American Coatings Corporation Cable Coating 2B, Decadex Laboratories Firecheck, Fiberlock Technology ABC Asbestos Binding Compound Concentrate, or approved equal.

B. The Contractor will have at all times in his possession at the job site Material Safety Data Sheets (MSDS) for wetting agents, encapsulants, solvents, strippers, and any other potentially hazardous materials.

2.02 PERSONNEL PROTECTIONS

A. Personnel protection is required for laborers, mechanics, supervision and visitors at the work site during the set-up and abatement operations.

B. Each worker shall be supplied with a minimum of two (2) complete protective work clothes and respirator filter changes per day for the complete duration of the project. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable shoe covers and must meet the requirements and specifications in ANSI Z-41.1. Eye wear and face protection must meet the standards and specifications of ANSI Z-87.1.

C. In addition to sets of protective work clothes for workers, the Contractor shall have on hand two (2) additional sets of disposable work clothes, per day and respirators for personnel who are authorized to inspect the work site. Hard hats should be available as appropriate which meet ANSI Z-41.1. Eye wear and face protection must meet the standards and specifications of ANSI Z-87.1.

D. Respirators approved for asbestos use and protective work clothes will be worn by laborers and mechanics as a minimum during set-up operations (plastic draping, light-fixture dropping or removal, etc.).

E. Appropriate respirators will be worn by all personnel in the active work area.

F. Upon leaving the active work area, filters will be discarded, cartridges removed and respirators cleaned in disinfectant solution and clean water rinse.

G. Clean respirators will be stored in plastic bags when not in use.

H. Respirators will be inspected daily for broken, missing, or deteriorated parts.

PART 3 - EXECUTION

3.01 AREA PREPARATION

A. Movable furniture, blinds and equipment will be removed from area of work by the Client Agency.

B. Heating and ventilating system servicing the areas of work must be shut down prior to starting any work. Notify the Institution prior to starting any work in order that they may arrange to have the heating and ventilating system shut down.

C. The Contractor shall isolate the work area for the duration of the work by installing critical barriers completely sealing off all openings in the work area, including, but not limited to, heating, ventilation ducts, doorways, corridors, windows, roof ventilator openings, and wall vents, with plastic sheeting taped securely in place with six (6) mils plastic sheeting.

D. The Contractor shall build decontamination chamber(s) to be connected to each active work area for entrance to or exit from the active work area. When required a separate material load out unit shall be constructed.

E. All floor and wall surfaces in the work areas shall be covered with plastic sheeting taped securely in place to protect them from water damage and asbestos contamination.

F. The Contractor shall cover all fixtures, fixed demountable partitions, lighting, fixed items and equipment in the work area with plastic sheeting taped securely in place.

G. Duct tape, staples, wood strips and other methods will be used appropriately to attach vertical plastic barriers to walls and to floors. All edges of plastic material shall overlap the adjoining sheet a minimum of twelve inches. All joints (vertical and horizontal) to be continuously sealed with duct tape.

H. Upon completion of area isolation, the Contractor shall remove, where practical, all detachable electrical heating and ventilation equipment, wipe and vacuum, clean and remove from active work area.

3.02 DECONTAMINATION UNIT (USAGE AND ACTIVITIES)

A. Outside room (clean room). In this room the worker leaves all street clothes and dresses in clean working clothes (usually disposable coveralls). Respiratory protection equipment is also stored in this area. No asbestos contaminated items should enter this room. Workers enter this room either from outside the structure dressed in street clothes, or naked from the showers, after showering.

B. Shower Room: This is a separate room used for transit by cleanly dressed workers entering the job from the outside room or by workers headed for the showers after undressing in the equipment room.

C. Equipment Room (contaminated area): Work equipment, footwear, additional contaminated work clothing are left here. This is a change and transit area for workers.

D. Decontamination chambers require temporary services. Verify during bidding period the availability for temporary hook up. Mobilization, hook-up and demobilization, disconnection costs will be the responsibility of the Contractor. Installation of temporary services during demolition shall be per current EPA and OSHA regulations.

E. Work Area: The work area should be separated by polyethylene barriers from the equipment room. If the airborne asbestos level in the work area is expected to be high, as in dry removal an additional intermediate cleaning space may be added between the equipment room and the work area. Isolation of the work areas, as required, is necessary to prevent contamination and fiber dispersal to other areas of the building during work and clean-up operation. Air movement will flow uninterrupted from outside the work area through the change and equipment rooms and into the active work area. It is then HEPA filtered and exhausted to the building exterior.

3.03 WORK AREA ENTRANCE/EXIT

A. All workers involved in the removal of asbestos will utilize the following procedure for work area entrance and exit.

B. The worker enters the outside room and removes clothing, puts on clean coveralls, gloves and respirator. Protective clothing sleeves will be taped to gloves and protective clothing legs will be taped to foot covers. The neck collar, zipper seam, wrists and ankles of protective clothing will be taped closed.

C. Worker proceeds via shower room to equipment room. Any additional clothing and equipment left in equipment room and required by worker is put on. This includes additional warm garments workers usually provide themselves when the work area is too cold for coveralls only. These must be treated as contaminated clothing and left in the decontamination area.

D. Worker proceeds to work area.

E. Before leaving the work area, the worker should remove all gross contamination and debris from the protective clothing, by vacuuming down the clothes with a vacuum cleaner with a HEPA filter. In practice, this is carried out by one worker assisting another.

F. The worker proceeds to equipment room and removes all clothing except respiratory protection equipment. Extra work clothing may be stored in contaminated end of the area.

G. Disposable protective clothing is placed in a bag for disposal. The worker then proceeds into the shower room. Respiratory protection equipment should only be removed after wetting in shower to prevent inhalation of fibers. Ensure that employees shower every time upon exiting the work area and before entering the clean room.

H. After showering, the worker moves to the clean room and dresses in either new protective clothes for another entry, or street clothes if leaving. Respirator filters are sealed with tape or thrown away if spent, and respirator body is thoroughly cleaned and brought to the clean room.

I. Workers shall not eat, drink, smoke, chew gum, or chew tobacco in the work area. To eat, drink or smoke, workers shall exit the work area following the decontamination procedure outlined above.

J. All footwear shall be left inside work area until completion of the job, then cleaned or discarded.

3.04 METHOD OF REMOVAL

A. Remove and dispose of all asbestos-containing materials (ACM) in accordance with the methods and procedures outlined in the United States Owner of Labor, Occupational Safety and Health Administration (OSHA) Asbestos Regulations, Codes of Federal Regulations Title 29, Part 1926, Section 1926.1101.

B. Dry removal will not be allowed except when wet removal will create a safety hazard. Dry removal process will require written authorization by EPA and the Owner except when work area has freezing conditions.

C. Work of this section shall be performed in the following manner:

1) Eliminate air flow into containment area by isolating all supply and return air ducts from mechanical system. Turn off electrical power.

2) Install six (6) mil polyethylene critical barriers over all doors, wall openings, ceiling openings, electrical outlets, etc. Secure with duct tape on all sides.

3) ix (6) mil polyethylene protecting ceiling surface from wall to wall.

4) Six (6) mil polyethylene protecting wall surface from floor to ceiling.

5) Isolation barriers separating occupied areas and work areas shall be framed and covered with 1/2 inch plywood and two (2) layers of six (6) mil polyethylene.

6) Duct HEPA filter unit through door. Locate unit to prevent dead air pockets.

7) Install triple air curtain, six (6) mil polyethylene (typical), over door opening into decontamination unit or load out unit.

3.05 HOUSEKEEPING

A. Throughout the work period, the Contractor shall maintain the building and site in a standard of cleanliness as specified throughout these specifications.

B. Contaminated disposable clothing, respirator filters and other debris will be bagged, properly labeled and sealed at the end of each work day.

C. All asbestos generated by either removal, encapsulation or repair will be bagged, properly labeled, and sealed at the end of each work day.

D. Respirators will be thoroughly cleaned at the end of each work day and stored for the next day's use.

E. Retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection of materials.

F. Do not allow the accumulation of scrap, debris, waste material, and other items not required for completion of this work.

G. At least weekly, and more often if necessary, completely remove all scrap, debris and waste material from the job site.

H. Unless otherwise noted or directed, materials resulting from demolition operations shall be the property of the Contractor, shall not be used in the work and shall be promptly removed from the site.

I. Daily and more often if necessary, inspect the work areas and adjoining spaces, and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

J. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

K. Maintain the site in a neat and orderly condition at all times.

L. Compressed air is not to be used for cleaning purposes.

3.06 FINAL DECONTAMINATION OF WORK AREA

A. Following careful double bagging of all removed asbestos material by the Contractor, he shall label bags as required.

B. Bags shall be wiped with clean damp cloths prior to transportation to approved disposal site.

C. With critical barriers in place, sheet plastic on walls, floors, and ceiling, the negative pressure system operating, the Contract shall carry out the first cleaning. If there are two layers of wall, floor, and ceiling plastic, clean outer layer as described below and remove carefully. With one layer of wall, floor, and ceiling plastic in place, use damp cleaning cloth to wipe surfaces of plastic. Use each surface of a cleaning cloth one time and then dispose of as contaminated waste.

D. Continue this cleaning until there is no visible debris from removed material or residue on plastic sheeting. This first cleaning shall extend to include the Equipment Room (Dirty Room) in the decontamination unit.

E. Pressure washing techniques of any kind are strictly prohibited.

F. Pre-Encapsulation Inspection of substrate is performed by Consulting Firm to ensure removal and cleaning of the substrate is adequate. The Contractor may accompany this inspection. If during the inspection, the substrate or plastic sheeting isn't cleaned to the satisfaction of the Consulting Firm, additional re-cleaning will be required to meet the satisfaction of the Consulting Firm.

G. Encapsulate substrate and all remaining plastic sheeting within the work area. A colored encapsulant may be used on non-finished surfaces.

H. After encapsulant has dried, remove floor, wall, and ceiling plastic carefully by folding inwards into bundles and bagged for disposal. NOTE: Final barriers are not to be removed until work is completed.

I. With critical barriers in place, negative pressure system operating, and immovable objects covered with plastic sheeting, perform a second cleaning as was done in the first cleaning. Wet mop any hard floor surfaces. HEPA vacuum carpeted area surfaces. Hard surfaced flooring such as concrete, terrazzo, VAT and ceramic tile, shall be wet mopped, allowed to dry, and damp mopped a second time with clean mop heads. All mop heads and cleaning cloths are to be discarded in the same manner as asbestos waste.

J. All surfaces are to be left visually clean.

K. Perform visual inspection of work area Consulting Firm and Contractor shall complete Certification Of Visual Inspection form found at the end of this section.

L. The Consulting Firm shall take pre-clearance samples as specified in Air Sample Schedule, Section 1.07 as soon as feasible but no longer than twenty-four (24) hours after completion of all cleaning work, or as may be specified by the Owner. If pre-clearance criteria are met, proceed with air testing for final clearance by Transmission Electron Microscopy (TEM).

M. If pre-clearance criteria is not met, repeat final cleaning until additional tests indicate acceptable levels have been achieved before proceeding with final clearance testing by TEM. Costs associated with additional cleaning and testing shall be borne by the Contractor.

N. After air testing clearance criteria has been met, critical barriers and negative air pressure system can be removed.

3.07 DISPOSAL OF ASBESTOS WASTE

A. All RACM and miscellaneous ACM debris will be transported to the predesignated disposal site in accordance with the guidelines of the U.S. Environmental Protection Agency, Title 40, Part 61, Subpart M, and all local agencies' regulations. Ensure all waste bags/leaktight container have facilities name, address, and contact person as required by NESHAP. Drums are to be used to transport bagged ACM's as required by regulation(s).

B. EPA NESHAP Category I &II nonfriable ACM may disposed of as C&D waste as allowed by regulation. If nonfriable materials become friable they must then be disposed of as regulated ACM waste in an approved landfill.

C. Workers loading/unloading the asbestos materials and machinery operators will wear respirators and disposable work clothing when handling material at the project and disposal site. Asbestos warning signs shall be posted on vehicle as required by regulation.

D. The bags may be dumped from the drums into the burial site. If drums are used to transport the ACM bags, the bags may be dumped from the drums into the burial site. The drums may be reused. However, if a bag is broken or damaged, the entire drum should be buried.

E. The landfill area used for dumping shall be certified to receive and buy materials contaminated by asbestos.

F. Obtain completed Waste Shipment Record (WSR) for all RACM. WSR must also indicate amount of waste in cubic yards. Submit signed WSR with final report/Project Close-out.

3.08 INSPECTIONS

A. All work procedures detailed in this specification will be strictly adhered to and meet or exceed all current EPA, OSHA, DEP, ASTM and PDL&I regulations.

B. All work shall meet with the approval of the Owner. Work which does not meet with the approval shall be determined to be unsatisfactory.

ASBESTOS CERTIFICATION OF VISUAL INSPECTION

Project Name:_____

Project Number:_____

Building Name:_____

Work Area Location:_____

ABATEMENT CONTRACTOR CERTIFICATION

In accordance with Project Specifications and scope of work, the abatement contractor hereby certifies that the Abatement Contractor has visually inspected the work area (all surfaces including pipes, beams, ledges, walls, ceiling and floor, decontamination unit, sheet plastic, etc.) and has found no asbestos dust, debris or residue.

Abatement Contractor Name:_____

Signature:_____ Print Name:_____

Print Title:_____ Date:_____

END OF SECTION

SECTION 02 4116 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of a building.
2. Demolition and removal of selected site elements.
3. Patching and repairs.

1.2 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner, and ready for reuse where requested.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to remain: Protect construction indicated to remain against damage and soiling during selective demolition.

1.3 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site, including sub-contractors, Architect, Engineer, and Owner.

1.4 MATERIALS OWNERSHIP

A. Demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 PROJECT CONDITIONS

A. The Owner occupies portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so that Owner's operations will not be disrupted. Provide not less than 72 hours notice to the Owner of activities that will affect Owner's operations.

1.6 WARRANTY

A. Existing special Warranty: Remove, replace, patch and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

2.2 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Engineer.

D. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction.

3.3 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference to adjacent occupied and used facilities.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required.
2. Provide temporary weather protection during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.

C. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

1. Construct dustproof partitions of not less than nominal 4-inch (100-mm) studs, 5/8-inch (16-mm) gypsum wallboard with joints taped on occupied side, and 1/2 inch (13-mm) fire-retardant plywood on the demolition side.
2. Insulate partition to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.

D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. Use water mist, temporary enclosures and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice flooding and pollution.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Clean adjacent structures and improvements of dust, dirt and debris caused by selective demolition operations. Return adjacent areas to existing condition before start of selective demolition.

3.5 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
2. Neatly cut openings and holes plumb, square and true to dimensions required. Use cutting methods lease likely do damage construction to remain or adjoining construction. to minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.

C. Remove no more existing roofing than can be covered in one day by new roofing. See applicable Division 07 Section for new roofing requirements.

3.6 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.

C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

D. Patch and repair wall surfaces where demolished walls extend one finished area into another. Provide a flush and even surface of uniform color and appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began

END OF SECTION 02 4116

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. Division 01 Section “Construction Waste Management”
2. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Joint-filler strips.
12. Repair materials.

C. Material test reports.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt

irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

F. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, color as indicted on Architectural Contract Documents.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513 for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572 for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, 15 mil ‘STEGO’. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 15 mils (0.25 mm) thick.

C. Granular Material: Refer to Geotechnical Report.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Portland cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated on contract documents.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities per Architectural documents and designated by ACI 347 as abrupt or gradual, as follows:

Select surface classes, usually two or more, from two subparagraphs below. See discussion in "Formwork" Article in the Evaluations. Coordinate with rough- and smooth-form finishes in "Finishing Formed Surfaces" Article.

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

Retain one of two options in first paragraph below. ACI 301 requires chamfers, unless otherwise specified.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.3 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.4 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturers recommended tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction or Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Do not add water to concrete during delivery, at project site, or during placement unless approved by Architect.`

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view as indicated on Architectural documents..

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete as indicated on Architectural documents.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated on Architectural documents.

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes and as indicated on Architectural documents.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo and as indicated on Architectural drawings.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system and as indicated on Architectural documents.
2. Finish on-grade and supported surfaces to the applicable minimum following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface. The contractor shall supply floor leveling material and other corrective measures in areas where floor finish provisions exceed the flatness and levelness requirements.

    a. For carpeted slabs, specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    b. For thin floor coverings, specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method and as indicated on Architectural documents. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or

adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete, Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

Delete subparagraph above or first subparagraph below, or retain both if applicable. Above uses an underlayment; below, a topping.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Except as otherwise indicated on drawings or specified herein, all work under this Section shall conform to applicable requirements of the local building code and regulations of all government authorities having jurisdiction, applicable state code, and ACI 318.

B. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections, and to prepare and submit reports.

C. Testing shall at least meet the minimum requirements set forth in ACI 301.

D. Testing frequency shall at least meet the minimum requirements set forth in ACI 301 – specifically, obtain at least one composite sample for each 100 yd^3, or fraction thereof, of each concrete mixture placed in any one day. When the total quantity of a given concrete mixture is less than 50 yd^3, the strength tests may be waived by the Architect/Engineer.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Brick
3. Mortar and grout.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Steel reinforcing bars.
7. Miscellaneous masonry accessories.

B. Related Sections:

1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.

2. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:
1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
2. Colored mortar.

D. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

1. Exposed Decorative CMUs.
2. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
3. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
4. Weep holes and vents.
5. Accessories embedded in masonry.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.6 Prism Test: For each type of construction required, according to ASTM C 1314.

1.7 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include data on material properties and material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Standard Concrete Block

1. Portland cement, ASTM C 150, Type 1, low alkali (less than 0.6%), single source for entire project.

2. Aggregates, ASTM C 331, lightweight expanded shale, clay or slate aggregates, manufactured by the rotary kiln process equal to "Solite," "Norlite," or "Haydite."

    a. Block scheduled to receive painted finish shall contain normal weight aggregate meeting ASTM C 33 in addition to lightweight aggregate in order to receive a smooth, uniform finish.

3. Concrete Masonry Units: Load bearing concrete masonry units conforming to the requirements of ASTM C 90, Type 1. Provide units with minimum average net-area compressive strength of 1900 psi. Density Classification: Normal weight.
    a. Block behind face brick and block for rated walls shall be 75% solid units.
    b. All other block may be hollow units.

4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2) hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.

5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.

6. Finish: For exposed or painted block surfaces, in addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.

7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.

8. Density of concrete block shall not exceed one hundred and five (105) lbs. per cubic foot.

9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-99.

10. Water Content
    a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
    b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

E. Joint Reinforcing for Masonry Walls

2. For block walls forming part of exterior wall construction behind exterior stone veneer, provide super heavy duty reinforcing fabricated of 3/16" dia. side and cross rods, truss or ladder design, ties, spaced every block course. Provide prefabricated pieces at corners and intersections of walls or partitions.

    a. Reinforcing assembly shall be hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft., after fabrication.

3. For interior block walls and partitions, provide standard reinforcing fabricated of 9 ga. side and cross rods, truss or ladder design, no ties, spaced every other block course. Provide prefabricated pieces at corners and intersections of walls or partitions. Reinforcing shall be mill galvanized conforming to ASTM A 641, Class B-1, applied after fabrication.

4. Wire used in assemblies noted above shall be cold drawn steel wire conforming to ASTM A 82.

5. Approved Joint Reinforcing Manufacturers
    a. Hohmann & Barnard
    b. Wire-Bond
    c. Heckmann Building Products
    d. National Wire Products Industries, Inc.

F. Brick

1. Provide Modular-size field and accent bricks, in colors to match the existing building.

G. Anchors and Ties

1. For anchoring brick to cold-formed metal framing, provide one of the following or approved equal by other manufacturers noted above in Para. F.5:

    a. "Wing-Nut Pos-I-Tie®" with self-drilling screw for steel studs zinc barrel and thermal wing nut as manufactured by Heckmann Building Products. Provide "Seismic Wire Pintle Tie" hot-dip galvanized steel.

b. Hot-dip galvanized steel anchors equal to "X-Seal Veneer Anchor" with "XSeal Tape" as manufactured by Hohmann & Barnard or approved equal. Provide Model 187 "Seismiclip" with 9 gauge wire.

2. Dovetail Anchor Slots: Hot-dip galvanized steel, 16 gauge, equal to No. 100 Dovetail Anchor Slot made by Heckmann Building Products, No. 305 anchor slot made by Hohmann & Barnard, or approved equal by other manufacturers in Para. F.5.

3. Flexible Metal Ties for Dovetail Slots: Hot-dip galvanized, 16 gauge by 1" wide by Heckmann Building Products Inc., or approved equal manufacturer noted above in Para. F.5.

   a. No. 106 Dovetail Corrugated Anchor.

   b. No. 129 Dovetail Triangle Tie.

4. Wire Mesh: Hot-dip galvanized sixteen (16) gauge steel wire, square mesh, width 3" by length to suit condition; No. 268 by Heckmann Building Products, or approved equal by manufacturer noted above in Para. F.5.

5. For anchoring face brick to concrete back-up where there are no dovetail slots provided, provide "CMU/Concrete Screw Wing-Nut Pos-I-Tie®" with five (5) gauge hot-dip galvanized (ASTM A 153, Class B-2) wire pintle tie made by Heckmann Building Products, or approved equal by manufacturer noted above in Para. F.5.

6. For anchoring CMU wall, at the exterior masonry cavity wall, to the underside of the concrete beam, provide dovetail slot as noted above and the following:

   a. No. 121 galvanized steel dowel anchor and No. 421 tube as manufactured by Heckmann Building Products or approved by manufacturer noted above in Para. F.5. Galvanized to conform to ASTM A 153, Class B-2.

   b. No. PTA-310 galvanized steel dowel anchor and No. NS-TA joint filler as manufactured by Hohmann & Barnard or approved equal by manufacturer noted above in Para. F.5. Galvanizing to conform to ASTM A 153, Class B-2.

7. For anchoring masonry to structural steel, provide hot-dip galvanized steel, as listed, or approved equal by manufacturer noted above in Para. F.5:

   a. Made by Heckmann Building Products. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.

      1). No. 195 Column Anchors
      2). No. 197 Column Anchors
      3). No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties
      4). No. 315-B Weld-On Anchor Straps with No. 316 Triangle Ties

b. Made by Hohmann & Barnard or approved equal. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.

1). No. 355 Column Anchors
2). No. 356 Column Anchors
3). No. 357 Beam Anchors
4). No. 359 F anchor straps with VWT tie.

8. For anchoring CMU interior partitions to underside of steel beams, provide hot dip galvanized steel tube anchors equal to No. 419 and No. 421 made by Heckmann Building Products, No. PTA-420 made by Hohmann & Barnard, or approved equal by manufacturer noted above in Para. F.5.

9. For anchoring CMU interior partitions to underside of structural deck, provide 4" x 4" x 1/4" galvanized steel angles (ASTM A 36), 3'-0" long spaced 3'-0" o.c. alternately on each side of partition. Anchor partition securely to structural deck.

H. Reinforcing Bars and Rods: Uncoated steel, ASTM A 615, Grade 60. See Drawings for size.

I. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

J. Control and Expansion Joint Fillers

1. Vertical Installation Within Concrete Masonry Wall: Extruded high grade neoprene rubber, cross shape, for use with concrete masonry sash units, which shall provide a force fit in the grooves of the sash block, and shall have 1/2" diameter tubular ends (compressed 25% when installed in 3/8" wide joint).

a. Provide the following sizes:

1). 2-5/8" wide control joint fillers for 4" block walls.
2). 4-5/8" wide for 6" block walls.
3). 6-5/8" wide for 8", 10" and 12" block walls.

b. Provide backer rod and sealant joint over joint filler as per drawings and Section 079200 of these specifications.

2. Isolation Joint Filler at Abutting Construction and at Intersecting CMU Walls: Compressible and resilient closed cell neoprene gasket with pressure sensitive adhesive backing, thickness 30% greater than thickness of joint. Acceptable joint filler shall be "Everlastic, Type NN-1" by Williams Products, Inc., or approved equal. Recess joint filler and install backer rod and sealant as per drawings and Section 079200 of these specifications.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type 1, standard color, one source. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.'

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: Clean, washed, buff colored sand, graded per ASTM C 144.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean, fresh and suitable for drinking.

2.3 MORTAR MIX

A. Mortar for Unit Masonry: Mortar mixes shall meet ASTM C 270, cement/lime mortar.

11. For masonry below grade or in contact with earth, use Type M.

12. For reinforced masonry, use Type S.

13. For mortar parge coats, use Type N.

4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

B. Pigmented Mortar: Provide coloring agent made by Davis Colors, Lehigh Cement or approved equal. Color of mortar to meet with Architect's approval. The Contractor may use pre-packaged colored mortar equal to "Color Mortar Blend" made by Glen-Gery.

1. Color of mortar must meet with Architect's approved sample and mock-up panel.

C. Mortar for Cement Cants: One (1) part Portland cement and four (4) parts sand, by volume.

D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout shall have a minimum compressive strength of 3000 psi when tested in accordance with ASTM C 1019.

1. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated.

2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

E. Mixing

1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.

2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes, not to exceed five (5) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be retempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.

3. Acceleration or other admixtures not permitted.

4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

F. Admixtures

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.

2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.

3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

2.4 MASONRY ACCESSORIES

A. Neoprene Joint Filler: Provide closed cell neoprene, Type NN-1, conforming to ASTM D 1056, Grade 1, high performance, as manufactured by Williams Products Inc., or equal made by D. S. Brown, Norton, or approved equal.

B. Weep Holes: Provide clear plastic weep holes 3/8" wide and 1-1/2" high by four (4) inches long equal to No. 342 made by Hohmann & Barnard or approved equal manufacturer listed above.

C. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual." Provide stainless steel flashing as specified in Section 076200.

D. Flexible Through-Wall Flashing: Use when metal flashing cannot be installed and where indicated. Provide 40 mil EPDM sheet membrane flashing, "Pre-Kleened EPDM Thru-Wall Flashing" as manufactured by Carlisle Corp., or approved equal. Provide sealants and tapes as recommended by the manufacturer. Provide preformed corner sections "end dams" with system when flashing is discontinuous.

1. Provide flashing for surface adhered applications at sheathed areas with 26 ga. stainless steel termination bar.

2. Wall flashing shall have 26 ga. stainless steel drip edge adhered to edge of flashing, drip edge shall be set in sealant as specified in Section 079200.

E. Acceptable Alternate Flashing: 60 mil uncured neoprene made by Emseal Corp. or American Hydro-Tech or 40 mil Hyload Flashing Membrane made by Hyload Inc.

F. Through-Wall Scuppers: Provide "1771 Roof Accessory - Downspout Nozzle" with bug screen as manufactured by J. R. Smith, or approved equal.

G. Cavity Drainage Material: Provide 10" high HDPE "Mortar Net" open mesh mortar net of width to fit masonry cavity shown on drawings, manufactured by Mortar Net USA, Ltd., or equal "Mortar Maze," made by Advanced Building Products.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.

3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay structural clay tile as follows:

1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- (6- to 10-mm-) thick joints.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for [4.5 sq. ft. (0.42 sq. m)] of wall area spaced not to exceed [24 inches (610 mm)] o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (914 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes
    b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at exterior walls, except cavity walls.

D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

E. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than [16 inches (406 mm)] o.c.
2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.
3. Provide rigid metal anchors not more than [24 inches (610 mm)] o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for [2.67 sq. ft. (0.25 sq. m)] of wall area spaced not to [24 inches (610 mm)] o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes
    b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties].
    c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Parge cavity face of backup wythe in a single coat approximately 3/8 inch (10 mm) thick. Trowel face of parge coat smooth.

D. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

3.7 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.
5. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 25 inches (635 mm) o.c. horizontally, with not less than one anchor for each [2.67 sq. ft. (0.25 sq. m)] [3.5 sq. ft. (0.33 sq. m)] of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.
6. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and horizontally. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 24 inches (610 mm), around perimeter.

3.8 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than [1/2 inch (13 mm)] [1 inch (25 mm)] [2 inches (50 mm)] wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape[as recommended by flashing manufacturer].
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of [4 inches (100 mm)] [8 inches (200 mm)], and through inner wythe to within 1/2 inch (13 mm) of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use weep/cavity vent products or open head joints to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than [60 inches (1520 mm)]

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level [B] [C] in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for [mortar air content] [and] [compressive strength].

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.13 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.14 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
3. Protect adjacent surfaces from contact with cleaner.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.15 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Structural steel.
2. Prefabricated building columns.
3. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 01 Section “Construction Waste Management”
3. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
4. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
5. Division 05 Section "Metal Stairs.”

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges.”

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use ASD; data are given at service-load level.

B. Moment Connections: Type PR, partially and FR, fully restrained.

C. Construction: As indicated on Contract Documents.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components. The contractor shall deliver to the engineer, at the completion of the job, one (1) electronic version of the final field copies of all steel erection drawing shop drawings.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, Fabricator, Professional Engineer, and Testing Agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

F. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes, HSS-Shapes: ASTM A 992/A 992M

B. Channels, Angles: ASTM A 36/A 36M

C. Plate and Bar: ASTM A 36/A 36M

D. Structural Sections: ASTM A 500, Grade C structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: As indicated on documents.
2. Finish: Black, except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Unheaded Anchor Rods: ASTM F1554, Grade 36 (ASTM F1554 Grade 55, weldable can be substituted for Grade 36) or as indicated on documents.

1. Configuration: Straight and threaded with nut for anchorage.
2. Nuts: ASTM A 563 heavy hex carbon steel.

3. Plate Washers: ASTM A 36/A 36M carbon steel to be used at all column baseplate locations.
4. Washers: ASTM F 436 Type 1, hardened carbon steel.
5. Finish: Plain

F. Headed Anchor Rods: ASTM F 1554, Grade 36 (ASTM F 1554, Grade 55, weldable can be substituted for Grade 36) straight with heavy-hex head, or as indicated on documents.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel to be used at all column baseplate locations.
3. Washers: ASTM F 436 Type 1, hardened carbon steel.
4. Finish: Plain

G. Threaded Rods: ASTM A 36/A 36M

1. Nuts: ASTM A 563 hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Plain.

H. Expansion Anchors: Type and size as indicated on documents. Wedge type, torque-controlled, with impact section to prevent thread damage and wedge ridges to prevent spinning during installation, complete with required nuts, washers, and manufacturer's installation instructions. All expansion anchors shall be equipped with length identification markings.

1. Interior Use: For use in conditioned environments free from potential moisture, provide carbon steel anchors with zinc plating in accordance with ASTM B633.
2. Exposed Use: In exposed, potentially wet, or otherwise corrosive environment, provide anchors of Type 304 or Type 316 stainless steel with stainless steel nuts, and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded faster. All nuts shall conform to ASTM A563 Grade A unless otherwise specified. Stainless steel anchors shall not be installed in contact with galvanized steel, aluminum, or other galvanically dissimilar metals.
3. Products: Provide the following:
   a. Hilti Kwik Bolt TZ Expansion Anchor for installation into concrete.
   b. Hilti Kwik Bolt III Expansion Anchor for installation into masonry.

I. Cartridge Injection Adhesive Anchors and rebar doweling: Threaded steel rod or inserts, complete with nuts, washers, polymer, cementitious, epoxy, or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on documents.

1. Interior Use: For use in conditioned environments free from potential moisture, provide threaded carbon steel rods conforming to ISO898, ASTM A36, or ASTM A 193, Grade B7 as indicated on documents.
2. Exposed Use: In exposed, potentially wet or otherwise corrosive environments provide stainless steel anchors, nuts, and washers in accordance with ASTM F593. Provide nuts and washers with matching alloy group and minimum poof stress equal to or greater than the specified minimum full-size tensile strength of

the externally threaded fastener. All nuts shall conform with ASTM F594 unless other otherwise specified. Stainless steel anchors shall not be installed in contact with galvanized steel, aluminum, or other galvanically dissimilar metals.

3. Products: Provide the following:

    a. Hilti HAS or HIT threaded rods or rebar (by others) with Hilti HIT HY-150 Adhesive for anchorage to masonry or stone. Hilti HIT HY-270 Adhesive System for anchorage to brick or concrete masonry (with screen tubes).
    b. Hilti HAS, HIS threaded rods or rebar (by others) for doweling with Hilti HIT-RE 500-SD Adhesive Anchoring System for anchorage to concrete.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer, complying with MPI #79 and compatible with topcoat unless otherwise indicated on documents or in Division 09.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20, ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members with reinforcing as indicated on documents.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 3, "Power Tool Cleaning", unless indicated otherwise on documents or in Division 09.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frames and/or located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 EXAMINATION

A. Verify, with Steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.4 ERECTION

A. Set structural steel accurately in locations, to elevations indicated, and according to AISC 303 and AISC 360.

B. Base, Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that

will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

D. Splice members only where indicated.

E. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M[and AWS D1.8/D1.8M] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field fillet welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, all suspect field fillet welds and all field full/partial penetration welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 05 3100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Roof deck.

B. Related requirements:
1. Division 01 Section “Construction Waste Management”
2. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
Division 09 painting Sections for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

2. The contractor shall deliver to the engineer, at the completion of the job, one (1) electronic version of the final field copies of all deck layout shop drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Canam United States; Canam Group Inc.
2. Nucor Corp.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following (Note: All roof deck to be fire-rated must have G60 (Z180) zinc coating minimum):

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

a. Color: Manufacturer's standard or as indicated on documents.

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 G60 zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

   a. Color: Manufacturer's standard or as indicated on document.
4. Deck Profile: As indicated on documents.
5. Profile Depth: As indicated on documents.
6. Design Uncoated-Steel Thickness: Minimum 0.0295 inch or as indicated on documents.
7. Span Condition: Triple span or more.
8. Side Laps: Overlapped or interlocking seam at Contractor's option unless otherwise indicated on documents.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth or as indicated on documents.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Piercing Hanger Tabs: Not acceptable.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

K. Galvanizing Repair Paint: ASTM A 780 SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

J. Suspended ceiling, light fixtures, ducts, pipes, or other utilities shall not be supported by the steel deck.

3.4 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal, or as indicated on documents.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart maximum or as indicated on documents.
3. Weld Washers: Install weld washers at each weld location where uncoated steel thickness is less than 0.028 inch (0.71 mm).

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, with self-drilling, No. 10 (4.8 mm) diameter or larger, carbon-steel screw, or for deck that is a minimum of 0.0474 inch (1.20 mm) thick, by welding with a minimum of 1-1/2 inch (38 mm) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Stainless-steel pipe and tube railings.

B. Related Requirements:

   1. Section 055112 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.
   3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of connecting and finishing members at intersections.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Stainless-Steel Pipe and Tube Railings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Blum, Julius & Co., Inc.
b. Paragon Aquatics.
c. Stainless Fabricators, Inc.
d. Sterling Dula Architectural Products, Inc; Div. of Kane Manufacturing..
e. Tri Tech, Inc.
f. Tubular Specialties Manufacturing, Inc.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 304.

B. Pipe: ASTM A 312/A 312M, Grade TP 304.

C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

D. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Expanded Metal: ASTM F 1267, Type II (expanded and flattened), Class 3 (corrosion-resistant steel), made from stainless-steel sheet, ASTM A 240/A 240M or ASTM A 666, Type 304.

1. Style Designation: 1-1/2 number 10

2.5 FASTENERS

A. General: Provide the following:
1. Stainless-Steel Railings: Type 304 stainless-steel fasteners.
2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide Phillips tamper-resistant hex socket machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Shop Primers: Provide primers that comply with Section 09.9100 Painting

F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

I. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

J. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

K. Form Changes in Direction as Follows:
   1. By bending

L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of railing members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

   1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

   1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

S. Expanded-Metal Infill Panels: Fabricate infill panels from expanded metal made from same metal as railings in which they are installed.

   1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.043 inch thick.
   2. Orient expanded metal with long dimension of diamonds parallel to top rail or perpendicular to top rail (Confirm with Architect).

T. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. 180-Grit Polished Finish: Oil-ground, uniform, directionally textured finish.

D. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.

E. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.

F. Directional Satin Finish: No. 4.

G. Dull Satin Finish: No. 6.

H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material or attached to post with set screws.

D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100 " Painting"

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05.5213

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim for Wood Wall Base.
2. Solid Wood Tambour

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of specified product.

B. Samples for Verification: For the following:

1. Lumber for Transparent Finish: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

a. Finish entire exposed surface.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.
B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.
C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.6 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity at occupancy levels during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide labels from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

2.2 INTERIOR STANDING AND RUNNING TRIM- SOLID WOOD TAMBOUR

A. Interior Standing and Running Trim and Solid Wood Tambour:

1. Architectural Woodwork Standards Grade: Custom.
2. Hardwood Lumber:

a. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
b. Species: Maple.
c. Cut: Plain sliced/plain sawn.

d. Wood Moisture Content: 5 to 10 percent.
e. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
f. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.

1) For veneered base, use hardwood lumber core, glued for width.

g. For base wider than available lumber, glue for width. Do not use veneered construction.
h. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

1. Fire-Retardant Treatment: Complying with requirements; provide where indicated.

B. Provide self-drilling screws for metal-framing supports, as recommended in writing by metal-framing manufacturer.
C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.4 FABRICATION

A. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling

for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.
B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION OF INTERIOR ARCHITECTURAL WOODWORK, GENERAL

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails for exposed fastening, countersunk and filled flush with interior architectural woodwork.

F. For shop-finished items, use filler matching finish of items being installed.
G. Preservative-Treated Wood Materials: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.
H. Fire-Retardant-Treated Wood Materials: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

3.3 INSTALLATION OF INTERIOR STANDING AND RUNNING TRIM

A. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
B. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
C. Scarf running joints and stagger in adjacent and related members.
D. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
E. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.4 REPAIR OF INTERIOR ARCHITECTURAL WOODWORK

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of the Architectural Woodwork Standards for the specified grade.
B. Where impossible to repair, replace defective woodwork.
C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.

    1. Fill nail holes with matching filler where exposed.
    2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

D. Field Finish: See Section “09900 Painting” for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 064023

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SECTION 06 1000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring.
5. Wood sleepers.
6. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 5% for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness, unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are located, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20-minutes, and with the flame front not extending more than 10-ft 6-inch beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated on the Contract Drawings.

3. Interior Type A: Treated materials shall have a moisture content of 28% or less when tested according to ASTM D3201 at 92% relative humidity. Use where exterior type is not indicated.

C. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

D. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

E. Application: Treat all miscellaneous carpentry, unless otherwise indicated.

1. Framing for raised platforms.

2. Concealed blocking.

3. Roof framing and blocking.

4. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: items indicated on Drawings.

2.4 DIMENSION LUMBER FRAMING

A. Framing Other Than Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Framing other than interior partitions.
2. Species:
   a. Douglas fir-larch (north); NLGA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Construction, or No. 2 grade lumber of any species.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.

D. For blocking not used for attachment of other construction, Utility, Stud or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm)] nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners complying with hot-dip zinc coating complying with ASTM A153/A153M.

B. Power-Driven Fasteners: NES NER-272.

C. Nails, Brads, and Staples: ASTM F1667.

D. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

E. Screws for Fastening to Metal Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. Simpson Strong-Tie Co., Inc.
3. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

2.9 STRUCTURAL COMPOSITE LUMBER

A. Laminated-Veneer Lumber (LVL): [Preservative-treated, structural][Structural] composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored in accordance with ASTM D5456, and manufactured with exterior-type adhesive complying with ASTM D2559.

1. Extreme Fiber Stress in Bending, Edgewise (Fb): As noted on drawings.

2. Modulus of Elasticity, Edgewise (E): As noted on drawings.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

3.2 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 1000

SECTION 06 1600 - SHEATHING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Division 07 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Wall sheathing.

2. Roof sheathing.

3. Sheathing joint and penetration treatment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicated component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturers and certification by treating plants that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.

2. Include data for fire-retardant treatment from chemical treatment manufacturers and certification by treating plants that treated plywood complies with requirements. Include physical properties of treated materials.

3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.

4. For products receiving waterborne treatment, include the statement that moisture content of treated materials was reduced to levels specified before shipment to the Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer.

B. Evaluation Reports: For the following, from ICC-ES:
    a. Wood-preservative-treated plywood.
    b. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:

    1. A testing agency providing classification marking for fire-retardant-treated materials, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE AND HANDLING

A. Stack panels with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheathing, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agencies.

    1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Thicknesses: As needed to comply with requirements specified, but not less than thickness as indicated on Drawings.

B. Factory mark panels to indicate compliance with applicable standards.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground. Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
    1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with a flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

3. Interior Type A: Treated materials shall have a moisture content of twenty-eight percent (28%) or less when tested according to ASTM D3201/D3201M at ninety-two percent (92%) relative humidity. Use where exterior type is not indicated.

4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM 5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg.F shall not be less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of fifteen percent (15%). Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.5 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Basis-of-Design Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. CertainTeed Corporation.
   b. Georgia-Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.

2. Type and Thickness: As indicated on the Drawings.

3. Size: 48-inches by 96-inches for vertical installation.

2.6 ROOF SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.

1. Span Rating: Not less than 24/0, unless indicated otherwise.

2. Nominal Thickness: As indicated on the Drawings.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacturer.

1. For roof, parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329-inch thick, use screws that comply with ASTM C1002.

2. For steel framing from 0.033-inch to 0.112-inch thickness, use screws that comply with ASTM C954.

2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing type and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2-inches wide, 10 threads/inch by 10 threads/inch or 10 threads/inch by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.9 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three (3) support members.

B. Cut panels at penetrations, edges, and other obstructions of Work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:
1. Table 2304.9.1 “Fastening Schedule,” in the ICC’s International Building Code.

2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where the opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall, parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials indicated over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, “Engineered Wood Construction Guide,” for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:
    a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8-inch apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer’s written instructions.

1. Fasten gypsum sheathing to wood framing with nails or screws.

2. Fasten gypsum sheathing to cold-formed metal framing with screws.

3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.

4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against the face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one (1) stud spacing. Attach at perimeter and within the field of panel to each stud.

1. Space fasteners approximately 8-inches O.C. and set back a minimum of 3/8-inch from edges and ends of panels.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within the field of panel to each stud.

    1. Space fasteners approximately 8-inches O.C. and set back a minimum of 3/8-inches from edges and ends of panels.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

SECTION 06 1753 - SHOP FABRICATED WOOD TRUSSES

PART 1 -GENERAL

1.1 SUMMARY

A. Section includes:
   1. Shop fabricated wood roof trusses
   2. Bridging, bracing, and anchorage.
   3. Metal truss accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Design Roof Live and Dead Load: As indicated on Drawings.

B. Maximum Vertical Deflection:
   1. Live load L/360 of span, Total Load L/240 of Span.

C. Minimum Truss Opening to Accommodate Mechanical Ducts: Provide truss openings sized to accommodate ducts and duct insulation at the location indicated on Drawings.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate sizes and spacing of trusses and associated components, web and chord sizes, plate sizes, fastener descriptions and spacings, loads and truss cambers, and framed openings

C. Product Data: Submit truss configurations for each type and size truss, bearing and anchor details, bridging and bracing requirements.

D. Design Data: Submit design calculations signed and sealed by Professional Engineer Registered in the State of Pennsylvania.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. Lumber Grading Agency: Certified by ALSC.
   2. Plywood Grading Agency: Certified by APA/EWA.

B. Truss Design, Fabrication, and Installation: In accordance with ANSI/TPI 1 and TPI HIB-91.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Pennsylvania.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Product Requirements: Product storage and handling requirements.

B. Handle and erect trusses in accordance with TPI HIB-91.

C. Store truss depth in vertical position resting on intermittent bearing pads.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
1. Alpine Engineered Products, Inc.
2. Shelter Systems Corporation.
3. Warren Truss Co.
4. Modu-Tech
5. Trussway.
6. Best Building Components.
7. Substitutions: Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Lumber Grading Rules: SPIB.

B. Wood Members: Southern pine Number 2 or better grade; 19 percent maximum and 7 percent minimum moisture content; single top and bottom chord. Finger scarfing not permitted.

C. Steel Plate Connectors: ANSI/TPI 1, Section 6; hot dip galvanized; die stamped with integral teeth.

D. Truss Bridging: Type, size and spacing recommended by truss manufacturer, temporary and permanent.

2.3 ACCESSORIES

A. Wood Framing for Openings: Softwood lumber as specified in Section 06100, fire retardant treated.

B. Fasteners and Anchors:
1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

C. Bearing Plates: Hot dip galvanized.

2.4 FABRICATION

A. Fabricate trusses to achieve structural requirements specified.

B. Brace wood trusses for support in accordance with TPI HIB-91.

C. Fabricate chord extensions as indicated on Drawings.

D. Fabricate to achieve minimum end bearing of 4 inches or as indicated on Drawings.

E. Frame special sized openings in web framing as indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 3000 - Administrative Requirements: Coordination and project conditions.

B. Verify supports and openings are ready to receive trusses.

3.2 PREPARATION

A. Coordinate placement of bearing and support items for correct location and elevation.

3.3 ERECTION

A. Set members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in alignment until completion of erection and installation of permanent bracing.

C. Do not field cut or alter structural members without approval of Architect.

D. Place headers and supports to frame openings.

E. Coordinate placement of sheathing with work of this Section.

F. After erection, touch-up damaged surfaces with primer consistent with shop coat

3.4 ERECTION TOLERANCES

A. Section 01 4000 - Quality Requirements: Tolerances.

B. Framing Members: 1/2 inch maximum, from indicated position.

END OF SECTION 06 1753

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim for Wood Wall Base.
2. Solid Wood Tambour

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of specified product.

B. Samples for Verification: For the following:

1. Lumber for Transparent Finish: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

a. Finish entire exposed surface.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.
B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.
C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.6 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.
B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity at occupancy levels during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide labels from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

2.2 INTERIOR STANDING AND RUNNING TRIM- SOLID WOOD TAMBOUR

A. Interior Standing and Running Trim and Solid Wood Tambour:

1. Architectural Woodwork Standards Grade: Custom.
2. Hardwood Lumber:

a. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
b. Species: Maple.
c. Cut: Plain sliced/plain sawn.

d. Wood Moisture Content: 5 to 10 percent.
e. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
f. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.

1) For veneered base, use hardwood lumber core, glued for width.

g. For base wider than available lumber, glue for width. Do not use veneered construction.
h. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

1. Fire-Retardant Treatment: Complying with requirements; provide where indicated.

B. Provide self-drilling screws for metal-framing supports, as recommended in writing by metal-framing manufacturer.
C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.4 FABRICATION

A. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling

for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.
B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION OF INTERIOR ARCHITECTURAL WOODWORK, GENERAL

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails for exposed fastening, countersunk and filled flush with interior architectural woodwork.

F. For shop-finished items, use filler matching finish of items being installed.
G. Preservative-Treated Wood Materials: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.
H. Fire-Retardant-Treated Wood Materials: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

3.3 INSTALLATION OF INTERIOR STANDING AND RUNNING TRIM

A. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
B. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
C. Scarf running joints and stagger in adjacent and related members.
D. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
E. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.4 REPAIR OF INTERIOR ARCHITECTURAL WOODWORK

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of the Architectural Woodwork Standards for the specified grade.
B. Where impossible to repair, replace defective woodwork.
C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.

1. Fill nail holes with matching filler where exposed.
2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

D. Field Finish: See Section “09900 Painting” for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 064023

SECTION 06 4116 – PLASTIC LAMINATE FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Plastic laminates, for each color, pattern, and surface finish.

1.3 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Manufacturers:
1. Stofanak Custom Cabinetry
2. American Millwork & Cabinetry

3. Yeager Custom Cabinetry

B. Grade: Premium

C. Type of Construction: Frameless Flush Overlay

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Reveal Dimension: 1/2 inch

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

G. Products: Subject to compliance with requirements, provide products as designated on the architect's drawings, or equal upon written approval from architect:

PL-01
Manufacturer: Formica, or pre-approved equals
Color: Refer to the architectural drawings for basis of design
Location: Casework Vertical Surfaces

H. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGL.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.

I. Materials for Semi exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

K.

1. As selected by Architect and noted on the drawings:
   a. Solid colors with core same color as surface, matte finish.
   b. Wood grains, matte finish.
   c. Patterns, matte finish.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
2. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. Medium-Density Fiberboard: ANSI A208.2, Grade 130 , made with binder containing no urea formaldehyde.
4. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter

E. Catches: Magnetic catches, BHMA A156.9, B03141

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.

G. Drawer Slides: BHMA A156.9.

1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
2. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
5. For computer keyboard shelves, provide Grade 1HD-100.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or

roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing screws for exposed fastening, countersunk and filled flush with woodwork.

E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

END OF SECTION 06 4116

SECTION 06 6500 - SOLID SURFACE FABRICATIONS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim solid surface product types:
   1. Countertops as noted on the Drawings
   2. Toe Kicks as noted on the Drawings
   3. Wall caps as noted on the Drawings
   4. Window Sills as noted on the Drawings

B. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry” for Blocking.
   2. Division 9 Section “Wall Cladding.”
   4. Division 15 Section “Plumbing Fixtures.”
   5. Division 16 Section “Wiring Devices.”

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Product data:
   1. For each type of product indicated.

B. Shop drawings:
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
      b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      c. Show locations and sizes of cutouts and holes for items installed in solid surface.

C. Samples:
   1. For each type of product indicated on the drawings.
      a. Submit minimum 6-inch by 6-inch sample in specified gloss.
      c. Indicate full range of color and pattern variation.
   2. Approved samples will be retained as a standard for work.

D. Product data:
   1. Indicate product description, fabrication information and compliance with specified performance requirements.

E. Product certificates:
    1. For each type of product, signed by product manufacturer.
F. Fabricator/installer qualifications:
    1. Provide copy of certification number.
G. Manufacturer certificates:
    1. Signed by manufacturers certifying that they comply with requirements.
H. Maintenance data:
    1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
        a. Maintenance kit for finishes shall be submitted.
    2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
    1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
B. Fabricator/installer qualifications:
    1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
C. Applicable standards:
    1. Standards of the following, as referenced herein:
        a. American National Standards Institute (ANSI)
        b. American Society for Testing and Materials (ASTM)
        c. National Electrical Manufacturers Association (NEMA)
        d. NSF International
    2. Fire test response characteristics:
        a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
            1) Flame Spread Index: 25 or less.
            2) Smoke Developed Index: 450 or less.

D. Coordination drawings:
    1. Shall be prepared indicating:
        a. Electrical work.
        b. Miscellaneous steel for the general work.
        c. Indicate location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.
    2. Content:
        a. Project-specific information, drawn accurately to scale.
        b. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
        c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
        d. Provide alternate sketches to designer for resolution of such conflicts.
            1) Minor dimension changes and difficult installations will not be considered changes to the contract.

E. Drawings shall:
    1. Be produced in 1/2-inch scale for all fabricated items.
F. Drawings must be complete and submitted to the architect within 60 days after award of contract for record only.
    1. No review or approval will be forthcoming.
    2. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

1.6 DELIVERY, STORAGE AND HANDLING
A. Deliver no components to project site until areas are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage to finished surfaces.
    1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY
A. Provide manufacturer's warranty against defects in materials.
    1. Warranty shall provide material and labor to repair or replace defective materials.
    2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

B. Manufacturer's warranty period:
    1. Ten years from date of substantial completion.

1.8 MAINTENANCE
A. Provide maintenance requirements as specified by the manufacturer.

PART 2 — PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers:
    1. Subject to compliance with requirements, provide products by one of the following:
        a. Corian Solid Surface (Basis of Design)
        b. HIMACS Solid Surface
        c. Wilsonart Solid Surface

2.2 MATERIALS
A. Solid polymer components
    1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
    2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:

1. 1/2 inch

C. Edge treatment:
1.As indicated on drawings

I. Performance characteristics:

Property	Typical Result	Test
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	1.5 x 10^{-6} psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	1.2 x 10^{-6} psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale ASTM D 785
	56	Barcol Impressor ASTM D 2583
Thermal Expansion	3.02 x 10^{-5} in./in./°C (1.80 x 10^{-5} in./in./°F)	ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets	No fracture—½ lb. ball: ¼" slab—36" drop ½" slab—144" drop	NEMA LD 3-2000 Method 3.8
Weatherability	ΔE^*_{94}<5 in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (¾") 0.6% (½") 0.8% (¼")	ASTM D 570
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50"Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

Approximate weight per square foot: ¼" (6 mm) 2.2 lbs., ½" (12.3 mm) 4.4 lbs.
Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories.
NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORIES

A. Joint adhesive:

1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:

1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

2.4 FACTORY FABRICATION

A. Shop assembly

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
    a. Reinforce with strip of solid polymer material, 2" wide.
4. Rout and finish component edges with clean, sharp returns.
    a. Rout cutouts, radii and contours to template.
    b. Smooth edges.
    c. Repair or reject defective and inaccurate work.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.

1. Color:
    a. To be selected from manufacturer's full range through (Corian).

B. Finish:

1. Provide surfaces with a uniform finish.

    a. Matte; gloss range of 5–20.

PART 3 — EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

1. Provide product in the largest pieces available.
2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
a. Exposed joints/seams shall not be allowed.
3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
4. Cut and finish component edges with clean, sharp returns.

5. Rout radii and contours to template.
6. Anchor securely to base cabinets or other supports.
7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

B. Coved backsplashes and applied sidesplashes:
1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

C. Coved backsplashes and sidesplashes:
1. Provide coved backsplashes and sidesplashes at all walls and adjacent millwork.
2. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on the drawings.
3. Adhere to countertops using manufacturer's standard color-matched Joint Adhesive.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.
B. Remove adhesives, sealants and other stains.

END OF SECTION 06 6500

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
   a. Tapered roof insulation
2. Mineral wool blanket insulation.
3. Glass-fiber blanket insulation.

B. Related Sections:

1. Section 042000 "Unit Masonry" for insulation installed in cavity walls.
2. Section 061600 "Sheathing" for foam-plastic board sheathing over wood or steel framing.
3. Section 071326 "Self-Adhering Sheet Waterproofing" for insulated drainage panels installed with waterproofing.
4. Section 072413 "Polymer-Based Exterior Insulation and Finish System (EIFS)" for insulation specified as part of these systems.
5. Section 075323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for insulation specified as part of roofing construction.
6. Section 078446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.
2. Type IV, 25 psi.

B. Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 or Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   a. Atlas Roofing Corporation.
   b. Dow Chemical Company (The).
   c. Rmax, Inc.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corporation.
   2. Johns Manville.
   3. Knauf Insulation.
   4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

D. Provide in thickness as indicated on Drawings.

2.3 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; complying with ASTM E136 for combustion characteristics.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. Johns Manville; a Berkshire Hathaway company
      b. Owens Corning

2.4 SAFING INSULATION

A. Asbestos-free, semi-refracting fibers in thickness and widths as required with the following attributes:
   1. Melting Point: Up to 2,000 degrees F;
   2. Non-Combustible in accordance with ASTM E 136;
   3. Density: 4.0 pcf minimum;
   4. Flame Spread/Smoke Density: 5/0 in accordance with ASTM E 84
   5. Moisture Absorption: Less than 1.0 percent per ASTM C 553;
   6. Product: “Fibrex Safing Insulation” as manufactured by Owens Corning. or “Thermafiber” by Thermafiber LLC, or “ROXUL SAFE” by Rockwool, or alternative of the quality necessary to meet the specifications.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.6 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 07 2726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fluid-applied, vapor-retarding membrane air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 VAPOR-RETARDING MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Products: Subject to compliance with requirements, W.R. Meadow's Air-Shield LSR or a comparable product by one of the following manufacturers:
   a. Carlisle Coatings & Waterproofing Inc.
   b. Henry Company.
   c. Tremco Incorporated.

2. Physical and Performance Properties:

   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M.
   c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. Butyl Strip: Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.

E. Modified Bituminous Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

F. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.

J. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

K. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

L. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms.

M. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

N. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
2. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
3. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
4. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, counterflashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements.

C. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.
14. <Insert value> of installed air barrier or part thereof.

C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than number of days recommended by manufacturer, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 2726

SECTION 07 5323 - EPDM SINGLE-PLY MEMBRANE ROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Adhered sheet roofing.
2. Roof insulation.

B. Related Sections include the following:
1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 07 Section "Joint Sealants."

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. FM Listing: Provide sheet membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:

a. Fire/Windstorm Classification: Class 1-90.

D. Roofing System Design: Provide a roofing system that complies with roofing system manufacturer's written design instructions and with the following:

1. SPRI's "Wind Design Guide for Adhered Roofing Systems."

    a. Exposure Category: As derived from the referenced SPRI guide or ASCE 7.
    b. System Design: Derive from design tables in the referenced SPRI guide or ANSI/RMA/SPRI RP-4, based on building height, parapet height, wind speed, and exposure category.

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, and details of the following:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch square of roof insulation.
3. 12-inch length of metal termination bars.
4. 2 insulation fasteners of each type, length, and finish.

A. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.

E. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

F. Warranty: Sample copy of standard roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.

G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and slopes indicated.

C. Preinstallation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings." Notify participants at least 5 working days before conference.

1. Meet with Owner; Architect; Construction Site Manager, Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review loading limitations of deck during and after roofing.
5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
6. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer’s name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Roofing Manufacturer's Extended System Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EPDM: ASTM D 4637, Type 1, class B or better, nonreinforced uniform, 60 mil, black, flexible EPDM sheet.
   a. Basis of Design Product: Subject to compliance with requirements, provide Carlisle SynTec Incorporated.
   b. Acceptable equals: Elevate, Johns Manville, or pre-approved equal.

2. Polyisocyanurate Board Insulation:
    a. Complys with ASTM-C1289
    b. Rigid closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
    c. Compressive strength: 20 psi
    d. Thickness: As indicated on Drawings.
    e. Joints: Staggerred.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with EPDM membrane roofing.

1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 90-mil- thick EPDM, partially uncured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Splice Adhesive and Cleaner: Single-component butyl splicing adhesive and solvent-based splice cleaner.

E. Splice Primer and Tape: Manufacturer's standard synthetic rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

F. Lap Sealant: Manufacturer's standard single-component sealant.

G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

H. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch wide, roll formed and prepunched.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

2.4 INSULATION MATERIALS

A. General: Provide preformed roof insulation boards that comply with requirements, selected from manufacturer’s standard sizes and of thicknesses indicated.

1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with the following taper:
    a. ¼” inch per 12 inches (1:48), unless otherwise indicated.
    b. Minimum thickness on tapered and flat areas to be 1 ½” or 3” depending on roof system. Refer to the Drawings.

2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents to comply with ASTM C 1289, classified by facer type as follows:

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.6 WALKWAYS

A. Protective surfacing for roof traffic shall be White Pressure-Sensitive Walkway Pads (with Factory-Applied Tape on the underside of the walkway) adhered to the membrane surface in conjunction with sealing primer.
   a. Provide where shown on the Drawings.

2.7 EDGE METAL COMPONENTS

a. Expansion Joint Support: Provide factory fabricated weatherproof, exterior covers for expansion joint openings consisting of flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows by a bifurcation process. Provide product manufactured and marketed by single-source membrane supplier that is included in the warranty. Basis of design: Carlisle, Expansion Joint Support, or approved equal

b. Roof Edge Drainage Systems: Gutter and Downspout Systems: Manufactured 0.040 aluminum with two-coat Kynar finish in section lengths not exceeding 12 feet with 0.100-inch mill aluminum internal Gutter Hangers, 24 inches on center, and 2 inch wide formed external wind straps 6'-0" on center. Basis of design: Carlisle, SecureEdge WR Gutter & SecureEdge Downspout, or approved equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.

D. Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections. At reroof areas, remove existing aggregate and asphalt flood coat as necessary to prepare surface for installation of cover board.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation and pre-formed shapes under area of roofing to conform to slopes indicated and to Shop Drawings.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Install required thickness in layers not to exceed 3” with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Attached Insulation (Mechanical): Secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type indicated. Install subsequent layers of insulation per Drawings.

1. Fasten insulation according to the insulation and roofing system manufacturers' written instructions.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck according to roofing system manufacturer's written instructions. All cover boards to be fastened with top surface fasteners.

3.4 ADHERED SHEET INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer’s written instructions. Unroll sheet and allow to ‘relax’ for a minimum of 30 minutes.
1. Install EPDM membrane according to roofing system manufacturers' written instructions.

B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Apply bonding adhesive to substrate and underside of sheet at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of sheet.

D. Mechanically or adhesively fasten sheet securely at terminations and perimeter of roofing.

E. Apply roofing sheet with side laps shingled with slope of roof deck where possible.

F. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing sheet in place with clamping ring.

3.5 SEAM INSTALLATION

A. Clean and prime both faces of splice areas, apply splice tape, then install 6” seam tape and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation.

B. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.6 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing as recommended by manufacturer.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer’s technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Construction Manager or Owner 48 hours in advance of the date and time of inspection.

3.8 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Construction Manager and Owner.

B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.9 ROOFING INSTALLER'S WARRANTY (submit completed form)

A. WHEREAS <*Name*> _____ of <*Address*> _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner:
2. Address:
3. Building Name/Type:
4. Address:
5. Area of Work:
6. Acceptance Date:
7. Warranty Period:
8. Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. peak gust wind speed 55 mph;
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.

3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

END OF SECTION 07 5323

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Exposed trim, gravel stops, parapet caps
2. Metal flashing
3. Reglets

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 04 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
2. Division 07 Section "Expansion Joint Cover Assemblies" for metal expansion-joint covers.
3. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
4. Division 07 Section "Roof Expansion Assemblies" for Elastic-sheet-covered foam, bellows-type roof expansion assemblies
5. Division 07 Section "Joint Sealants" for elastomeric sealants.
6. Division 07 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:

1. Wind Zone 2: Wind pressures of 31 to 45 psf.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.

1. 8-inch- square Samples of specified sheet materials to be exposed as finished surfaces.
2. 12-inch- long Samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Factory-Painted Aluminum Sheet: ASTM B 209, 3003-H14, with a minimum thickness of 0.040 inch, unless otherwise indicated.

B. Galvanized Steel Sheet (for work not exposed to view): ASTM A 526, G 90, commercial quality, or ASTM A 527, G 90, lock-forming quality, hot-dip galvanized steel sheet with 0.20 percent copper, mill phosphatized where indicated for painting; not less than 0.0396 inch thick, unless otherwise indicated.

C. Aluminum-Zinc Alloy-Coated Steel Sheet (for work not exposed to view): ASTM A 792, Class AZ-50 coating, Grade 40 or to suit project conditions, with 55 percent aluminum, not less than 0.0396 inch thick, unless otherwise indicated.

D. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch thick, unless otherwise indicated.

2.2 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

D. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

E. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

F. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.

1. Material: Aluminum, 0.024 inch thick.
2. Material: Galvanized steel, 0.0217 inch thick.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Fry Reglet Corporation.
2. Hickman: W.P. Hickman Co.
3. Keystone Flashing Company.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

E. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

F. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

G. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

H. Paper Slip Sheet: 5-lb/square red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

I. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

K. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

G. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Exposed Trim, Gravel Stops, and Fasciae and parapet caps: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.
2. Coil-Coated Galvanized Steel: 0.0276 inch thick.

C. Base Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

D. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.
2. Galvanized Steel: 0.0217 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.0217 inch thick.

E. Flashing Receivers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.
2. Galvanized Steel: 0.0217 inch thick.
3. Aluminum-Zinc Alloy-Coated Steel: 0.0217 inch thick.
4. Coil-Coated Galvanized Steel: 0.0217 inch thick.

F. Drip Edges: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

G. Eave Flashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

H. Equipment Support Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.
3. Coil-Coated Galvanized Steel: 0.0276 inch thick.

I. Overhead-Piping Safety Pans: Fabricate from the following material:

1. Galvanized Steel: 0.0396 inch thick.

2.6 ALUMINUM EXTRUSION FABRICATIONS

A. Aluminum Extrusion Units: Fabricate extruded-aluminum running units with formed or extruded-aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

2.7 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. Class I, Clear Anodic Finish: AA-C2241 (Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

2.8 COIL-COATED GALVANIZED STEEL SHEET FINISH

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

    a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.
    b. Resin Manufacturers: Subject to compliance with requirements, provide fluoropolymer coating systems containing resins produced by one of the following manufacturers:

        1) Ausimont USA, Inc. (Hylar 5000)
        2) Elf Atochem North America, Inc. (Kynar 500)

2. Coil-Coated Steel Sheet Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

   a. Cheney Flashing Company
   b. Copper Sales, Inc.
   c. MM Systems Corporation.
   d. Petersen Aluminum Corporation.
   e. Vincent Metals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except where pre-tinned surface would show in finished Work.

   1. Do not solder the following metals:

a. Aluminum.
b. Coil-coated galvanized steel sheet.

2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

I. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

J. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in concrete, furnish reglets for installation under Division 3 Section "Cast-in-Place Concrete."
2. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."

K. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.

L. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

M. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07 6200

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SECTION 07 8413 – THROUGH-PENETRATION FIRESTOPPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Sections:

1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

    a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    b. Classification markings on penetration firestopping correspond to designations listed by the following:

        1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following:
   1. Hilti, Inc.
   2. 3M Fire Protection Products.
   3. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

   1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
   2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those

components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-wool-fiber or rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 8413

SECTION 07 8446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

B. Related Sections:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hilti, Inc.
   b. Johns Manville.
   c. 3M Fire Protection Products.
   d. Tremco, Inc.; Tremco Fire Protection Systems Group.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 07.8446

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sealants for the following applications, including those specified by reference to this Section:
   1. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Tile control and expansion joints.
      d. Vertical control joints on exposed surfaces of interior unit masonry walls and partitions.
      e. Joints on underside of exposed concrete structure.
      f. Perimeter joints between interior wall surfaces and frames of interior doors, and windows.
      g. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      h. Joints between new unit masonry and existing concrete or masonry construction.
      i. Other joints as indicated.
   2. Interior joints in the following horizontal traffic surfaces:
      a. Control and expansion joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated.

B. Related Sections include the following:
   1. Division 08 Section "Glazing" for glazing sealants.
   2. Division 09 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
   3. Division09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

G. Field Test Report Log: For each elastomeric sealant application. Include information specified in "Field Quality Control" Article.

H. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.

J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   a. Perform tests under environmental conditions replicating those that will exist during installation.
2. Submit not fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:

1. Locate test joints where indicated or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:
   a. Type ES-1 elastomeric sealant for each joint substrate indicated.
   b. Elastomeric sealant for application to exterior insulation and finish system.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Test Method: Test joint sealants by hand-pull method described below:
   a. Install joint sealants in 60-inch- long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
   b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
   c. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
   d. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and

compression caused by structural settlement or errors attributable to design or construction.

2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: For each product of this description indicated in the Acoustical Joint-Sealant Schedule at the end of Part 3,

provide manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Acoustical Sealant for Concealed Joints: For each product of this description indicated in the Acoustical Joint-Sealant Schedule at the end of Part 3, provide manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Type C: Closed-cell material with a surface skin.
2. Type O: Open-cell material.
3. Type B: Bicellular material with a surface skin.
4. Type: Any material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
    a. Metal.
    b. Glass.
    c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

F. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
2. Test Method: Test joint sealants by hand-pull method described below:
   c. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
   d. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive

capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.

e. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

4. Inspect tested joints and report on the following:
   a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
   b. Whether sealants filled joint cavities and are free from voids.
   c. Whether sealant dimensions and configurations comply with specified requirements.

5. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

C. Testing Agency : Owner or Owner’s representative shall perform field tests and inspections.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.7 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Multicomponent Nonsag Polysulfide Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:
   a. cm-60; W.R Meadows, Inc.
   b. T-2235-M; Morton International, Inc.
   c. T-2282; Morton International, Inc.
   d. Thiokol 2P; Morton International, Inc.
   e. GC-5 Synthacalk; Pecora Corporation.
   f. Two-Part Sealant; Sonneborn Building Products Div., ChemRex Inc.
2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic)
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   a. Use O Joint Substrates: aluminum coated with a high-performance coating, galvanized steel, brick, ceramic tile, and wood.
6. Applications:
   a. Exterior joints between unit masonry, aluminum flashing, wood, aluminum storefront aluminum or aluminum clad windows and steel door frames.
   b. Interior and exterior expansion joints in unit masonry.
   c. Other joints indicated to receive sealant for which a specific sealant is not otherwise scheduled.

B. Mildew-Resistant Silicone Sealant : Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:

1. Products: Available products include the following:
   a. 786 Mildew Resistant; Dow Corning.
   b. Sanitary 1700; GE Silicones.
   c. NuFlex 302; NUCO Industries, Inc.
   d. 898 Silicone Sanitary Sealant; Pecora Corporation.
   e. PSI-611; Polymeric Systems, Inc.
   f. Tremsil 600 White; Tremco.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
   a. Use O Joint Substrates: ceramic tile, paint and porcelain fixtures.
6. Applications:
   a. Control or expansion joints within ceramic tile work.
   b. Joints between ceramic tile and adjacent fixtures and wall surfaces.

C. Multicomponent Pourable Urethane Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:
   a. Chem-Calk 550; Bostik Inc.

b. Vulkem 245; Mameco International.
c. Vulkem 255; Mameco International.
d. Pourthane; W.R. Meadows, Inc.
e. Elasto-Thane 920 Pourable; Pacific Polymers, Inc.
f. NR-200 Urexpan; Pecora Corporation.
g. NR-300 Urexpan, Type M; Pecora Corporation.
h. PSI-270SL; Polymeric Systems, Inc.
i. PSI-551/RC-2; Polymeric Systems, Inc.
j. Sikaflex - 2c SL; Sika Corporation.
k. SL 2; Sonneborn Building Products Div., ChemRex Inc.
l. THC-900; Tremco.
m. THC-901; Tremco.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic)
5. Uses Related to Joint Substrates: M, and as applicable to joint substrates indicated, O.
   a. Use O Joint Substrates: Concrete and unit masonry
6. Applications:
   a. Joints within concrete walkways and curbs
   b. Joints between exterior concrete and abutting masonry or asphaltic pavement.

3.8 LATEX JOINT-SEALANT SCHEDULE

A. Latex Sealant Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following
   a. Chem-Calk 600; Bostik Inc.
   b. NuFlex 330; NUCO Industries, Inc.
   c. LC 160 All Purpose Acrylic Caulk; Ohio Sealants, Inc.
   d. AC-20; Pecora Corporation.
   e. PSI-701; Polymeric Systems, Inc.
   f. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
   g. Tremflex 834; Tremco.
2. Applications: General purpose interior caulking.

3.9 ACOUSTICAL JOINT-SEALANT SCHEDULE

A. Acoustical Sealant for Exposed and Concealed Joints: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:
   a. Green Glue Noiseproofing Sealant, Green Glue
   b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corporation.
   c. SHEETROCK Acoustical Sealant; USG Corp., United States Gypsum Co.

2. Applications: Perimeter joints and penetrations of sound rated partitions.

END OF SECTION 07 9200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
3. Division 08 Section "Door Hardware".
4. Division 08 Section "Access Control Hardware".
5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).
4. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, and ANSI/SDI A250.4 for physical performance level.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.

    a. Provide 18 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.374 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.
    c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.378 and R-Value 2.5, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 797 Mercury Series.

2.4 SPECIAL FUNCTION HOLLOW METAL DOORS

A. Sound Resistant Doors: Subject to the same compliance standards and requirements as standard hollow metal doors, provide manufacturer's standard sound resistant acoustic core tested in accordance with ASTM E90, ASTM 413, and ASTM E1332 standards. Fabricate with minimum 16 gauge construction, 1-3/4" thickness, combined with standard flush frames designed for mid-range and high range sound attenuation from STC 39 through STC 52 applications. Furnish complete with perimeter sound seals, bottom seals, and threshold as required for specified STC rating.
   1. Provide sound resistant doors with minimum STC sound rating 46.
   2. Each unit to bear a physical label applied to door certifying the product construction and identifying the specific STC rating.
   3. Manufacturers Basis of Design:
      a. CECO Door Products (C) - Sound-Tech Express Series.
      b. Curries Company (CU) - 757 Quiet Noise Series.

2.5 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
   3. Manufacturers Basis of Design:

      a. Curries Company (CU) – Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
   3. Manufacturers Basis of Design:

      a. Curries Company (CU) - CM Series.
      b. Curries Company (CU) - M Series.
   4. Knock-down frames acceptable.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.

8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 08 1416 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.
4. Acoustic wood doors & frames

B. Related Sections:

1. Division 06 Section “Finish Carpentry”
2. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate doors to be factory finished and finish requirements.
4. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

a. Provide samples for each species of veneer and solid lumber required.

3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
4. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Doors shall be warranted by the manufacturer to be free of manufacturing defects for the life of the installation in the form of the "Standard Door Guarantee" published by the National Wood Window and Door Association (NWWDA), latest edition. Submit written guarantee in duplicate.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Deliver doors to building after wet trades have been completed and building is within normal occupancy humidity conditions. Deliver doors in manufacturer's individual original unopened protective materials, clearly marked with manufacturer's name and identifying symbol on covering.

C. Store doors flat with protective coverings provided to protect surfaces. Doors shall not be dragged over one another.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Coordination:

1. The Contractor shall provide door manufacturer with approved hardware schedules, templates and hand for all doors. Contractor shall advise door manufacturer of any changes after information has been forwarded. Contractor will be completely responsible for coordination between hardware, door and frame manufacturers;
2. Door manufacturer shall be responsible for properly coordinating information received by him, so that doors are properly finished, machined and ready to hang.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham Manufacturing, Corp.
4. Marshfield Door Systems, Inc..
5. Weyerhauser Architectural Doors.

2.2 DOOR CONSTRUCTION, GENERAL

A. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde resin.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware as follows:

    a. 5-inch top-rail blocking, in doors indicated to have closers.
    b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
    c. 5-inch midrail blocking, in doors indicated to have exit devices.

B. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
1. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

C. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware as follows:

    a. 5-inch top and bottom rail blocking.
    b. 4-1/2-by-10-inch lock blocks
    c. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

D. Sound Resistant Acoustic Wood Doors:
1. Subject to the same compliance standards and requirements as standard flush wood doors, provide manufacturer's standard sound resistant acoustic core tested in accordance with ASTM E90, ASTM 413, and ASTM E1332 standards. Fabricate with minimum 16 gauge construction, 1-3/4" thickness, combined with standard flush frames designed for mid-range and high range sound attenuation from STC 39 through STC 52 applications. Furnish complete with perimeter sound seals, bottom seals, and threshold as required for specified STC rating.
    a. Provide sound resistant doors with minimum STC sound rating 46.
    b. Each unit to bear a physical label applied to door certifying the product construction and identifying the specific STC rating.
    c. Glass: Type as tested to achieve STC and fire ratings factory installed.
    d. Acoustic seals: Provide perimeter and bottom seals, manufacturer standard.
    e. Manufacturers Basis of Design:
        1) AMBICO Wood Door Products
        2) Krieger Products

E. Thickness: All doors shall be 1-3/4 inch thick unless noted otherwise.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species: White Birch
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Exposed Vertical and Top Edges: Same species as faces.
8. Core: Particleboard.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LOUVERS AND LIGHT FRAMES

A. Metal Louvers:

1. Blade Type: Vision-proof, inverted V
2. Material: Hot-dip galvanized steel, 18 gauge frame, and 22 louver blades.
3. Finish: Baked-enamel.
4. Free Air Flow: 60 % free area.

B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

C. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of doors same as door stiles.

D. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 1416

SECTION 083613 - SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions to the Construction Contract”, “Special Conditions” and “Division 01 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Failure of components or operators before reaching required number of operation cycles.
c. Faulty operation of hardware.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
e. Delamination of exterior or interior facing materials.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.

    a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
    b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.3 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation; Thermacore Model 591 or a comparable product by one of the following:

    a. Raynor.
    b. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Air Infiltration: Maximum rate of 0.8 cfm/sq. ft. at 15 mph when tested according to ASTM E 283.

D. Installed R-Value: 12.0 deg F x h x sq. ft./Btu.

E. Steel Sections: Zinc-coated (galvanized) steel sheet.

1. Section Thickness: 1-5/8 inches.
2. Exterior-Face, Steel Sheet Thickness: Minimum 0.015 nominal coated thickness.
    a. Surface: Manufacturer's standard, grooved or ribbed.

3. Interior Facing Material: Zinc-coated (galvanized) steel sheet with a nominal coated thickness of manufacturer's recommended dimension to comply with performance requirements.
4. Interior Facing Material: 1/8-inch- thick, manufacturer's standard material.

F. Track Configuration: Match existing track configuration.

G. Weatherseals: Fitted to bottom and top and around entire perimeter of door.

H. Windows: Approximately 26 by 9 inches, with curved corners, and spaced apart the approximate distance as indicated on Drawings; in one row at height indicated on Drawings; installed with glazing of the following type:
1. Insulating Glass: Manufacturer's standard.

I. Locking Devices: Equip door with locking device assembly and chain lock keeper.

1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.

J. Counterbalance Type: Manufacturer’s standard.

K. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Type: Manufacturer's standard for door requirements.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior, clean, and dry.
5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic photoelectric sensor.

7. Control Station: Interior-side mounted.

L. Door Finish:
1. Baked-Enamel or Powder-Coat Finish: Color and gloss as selected by Professional from manufacturer's full range.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.

1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.
2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch- nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch- thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.

D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.

E. Provide reinforcement for hardware attachment.

F. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.

G. Interior Facing Material: Manufacturer's standard material complying with the acceptance criteria of DASMA 107, with indicated thickness.

H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.

1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.

    a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.

b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

2.7 HARDWARE

A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch- diameter roller tires for 2-inch- wide track.

D. Push/Pull Handles: Equip each push-up operated or emergency-operated door with galvanized-steel lifting handles on each side of door, finished to match door.

2.8 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders standard with manufacturer and keyed to building keying system.
2. Keys: Three for each cylinder.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Weight Counterbalance: Counterbalance mechanism consisting of filled pipe weights that move vertically in a galvanized-steel weight pipe. Connect pipe weights with cable to weight-cable drums mounted on torsion shaft made of steel tube or solid steel.

C. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer.

D. Cables: Galvanized-steel, multistrand, lifting cables with cable safety factor of at least 5 to 1.

E. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

F. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

G. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
   1. Comply with NFPA 70.
   2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. Electrical Characteristics:

    a. Phase: Single phase.
    b. Volts: 120V.
    c. Hertz: 60.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
5. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

    a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

L. Portable, Radio-Control System: Consisting of two of the following:

1. Three-channel universal coaxial receiver to open, close, and stop door.
2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
3. Remote antenna and mounting kit.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:

1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.

D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior and interior storefront framing.
   2. Storefront framing for punched openings.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:

      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Glazing-to-glazing contact.
      e. Noise or vibration created by wind and by thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units.

B. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft.of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

C. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

D. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

E. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 60 when tested according to AAMA 1503.

F. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

E. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

F. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

D. Accessible Entrances: Comply with applicable provisions in ICC/ANSI A117.1.

E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Hardware: Contractor shall provide this subcontractor with approved hardware information and template drawings for doors to be installed in aluminum frames. Contractor will be completely responsible for coordination between the hardware supplier and this subcontractor.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

    a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.

2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than the value indicated in the 2009 International Code Council's International Energy Conservation Code for aluminum-framed window systems, entrance doors, and windows.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

L. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 26.

M. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    b. Low Exterior Ambient-Air Temperature: 0 deg F.
    c. Interior Ambient-Air Temperature: 75 deg F.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Kawneer North America; an Alcoa company Trifab VG 451T (Basis of Design)
   2. EFCO Corporation.
   3. Tubelite.
   4. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
   5. YKK AP America Inc.

2.3 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   1. Sheet and Plate: ASTM B 209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

   1. Construction: Thermally broken for exterior applications, non-thermal for interior applications.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   3. Glazing Plane: As indicated

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from stainless steel.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 GLAZING SYSTEMS

A. Glazing: Comply with Section 08 8000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.6 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1¾ inch overall thickness, with minimum 0.188-inchhick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: As indicated on Drawings.

a. Accessible Doors: Smooth surfaced for width of door in area within 12 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: Prepare for, receive and install finish hardware as specified in Division 08 Section "Finish Hardware."

C. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

E. Silencers: BHMA A156.16, Grade 1.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

C. Simulated Divided Lites / “Muntins”: Fabricate storefront window units with muntin patterns as shown on the Contract Documents.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
    a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
    b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.5 CLEANING

A. Immediately prior to acceptance of the work, remove all protective materials and clean all exposed members.

B. Clean with materials free of abrasives or harmful cleaning agents.

3.6 PROTECTION

A. Protect all finished surfaces as necessary to prevent damage during progress of the work.

END OF SECTION 08 4113

SECTION 085113 - ALUMINUM WINDOWS (BALLISTIC RATED – Admin Building)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Projected windows.

B. Ballistic rated windows.

1.2 RELATED SECTIONS

A. Section 07900: Joint Sealers.

B. Section 08800: Glazing.

1.3 REFERENCES

AAMA 701/702 - Combined Voluntary Specifications for Pile Weather strip and Replaceable Fenestration Weather Seals.

A. AAMA 902 - Voluntary Specification for Sash Balances.

B. AAMA 907 - Voluntary Specification for Corrosion Resistant Coatings on Carbon Steel Components.

C. AAMA 910 - Voluntary "Life Cycle" Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors.

D. AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

E. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test/Consumer Products Safety Commission CPSC 16 CFR 1201.

F. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.

G. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

H. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

I. ASTM E 547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference

J. ASTM F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

K. ASTM F1233 - Standard Test Method for Security Glazing Materials and Systems.

L. ASTM F1642 - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings.

M. ASTM E 1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.

N. ASTM E 1996 – Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors

and Storm Shutters Impacted by Windborne Debris in Hurricanes. Miami-Dade County Protocols:
1. PA 201 - Impact Test Procedures.
2. PA 203- Cyclical Loading Test Procedures.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings:
   1. Elevation for each style window specified indicating its size, glazing type, muntin type and design.
   2. Manufacturer's head, jamb and sill details and section views for each window type specified.

C. Schedules:
   1. Provide a window schedule indicating the type, size, color, and operation of each unit specified. Coordinate with window mark types found in the Contract Drawings.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements.

1.5 SYSTEM DESCRIPTION

A. Test Units:
   1. Air, water and structural test unit shall conform to requirements set forth in AAMA/WDMA/CSA 101/I.S.2/A440.

A. Test Procedures and Performance:
   1. Windows shall conform to AAMA/WDMA/CSA 101/I.S.2/A440 requirements for each window type.
   2. Air Infiltration Test:
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 283 at static air pressure of 6.24 psf.
      b. Air infiltration shall not exceed that specified for each Product.
   3. Water Resistance Test:
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 331 and ASTM E 547 at static air pressure difference of 12 psf.
      b. There shall be no uncontrolled water leakage.
   4. Uniform Load Deflection Test:
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 330 at static air pressure (positive and negative) difference of 100% design pressure.
      b. During testing, no member shall deflect more than 1/175 of its span.
   5. Uniform Load Structural Test:
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 330 at static air pressure (positive and negative) difference 150% of design pressure.
      b. At conclusion of test, there shall be no glass breakage; no permanent damage to fasteners, hardware parts, support arms, or actuating mechanisms; no other damage which would cause window to be inoperable.
   6. Condensation Resistance Test (CRF):

a. With window sash closed and locked, test unit in accordance with AAMA 1503.1.
b. Condensation Resistance Factor (CRF) shall not be less than that specified for each Product.

7. Thermal Transmittance Test (Conductive U-Value):
   a. With window sash closed and locked, test unit in accordance with AAMA 1503.1.
   b. Conductive thermal transmittance (U-Value) shall not exceed that specified for each Product.
8. Life Cycle Test:
   a. Test window in accordance with AAMA 910.
   b. At conclusion of test, there shall be no damage to fasteners, hardware parts, support arms, or actuating mechanisms; no other damage which would cause window to be inoperable. Subsequent air infiltration and water resistance tests shall not exceed specified requirements.
9. Forced Entry Resistance Test: ASTM F 588, Type and Grade as indicated for each Product.
10. Blast Resistance Testing:
    a. Furnish windows capable of providing “low level of protection” or better, as defined in UFC 4-010-01, the DOD Anti-Terrorism Standard for Buildings, at the design blast load.
    b. Furnish window that do not transmit excessive loads to the structure at the design blast load.
    c. Provide Live Explosive Test Results and/or Independent Professional Engineer Calculations to indicate the ability of the window to be anchored into the type of wall specified in the Project.
    d. Anchors, clips, stops and other accessories shall be provided to comply with AAMA 101.1.S.2 and AAMA 907. Provide units and anchorage mechanism with sufficient strength to withstand required blast design pressure and strength for specified load conditions.
    e. Fastener, clips and other accessories shall be capable of delivering blast and rebound reactions to the adjacent structure.
    f. All screens, hardware, trim and covers must be sufficiently tested using live explosives to ensure that they do not disengage during an explosion.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: All windows and window hardware specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years’ experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing windows of the same type and scope as specified.

C. Provide test reports from AAMA accredited laboratory certifying that window units are found to be in compliance with AAMA/WDMA/CSA 101/I.S.2/A440-97 and performance standards listed above.
   1. Test reports shall be accompanied by the window manufacturer’s letter of certification stating that the tested window meets or exceeds criteria for the appropriate AAMA/WDMA/CSA 101/I.S.2/A440 test.

D. Code Compliance: Provide windows that comply with regulations of the code bodies having jurisdiction.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Testing for Air and Water as specified
4. Refinish mock-up area as required to produce acceptable work.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer’s recommendations.

B. Protect units against damage from the elements, construction activities and other hazards before, during, and after installation.

1.4 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.5 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Winco Window Co., 6200 Maple Ave., St. Louis, MO 63130-3305. ASD. Toll Free: 800-525-8089. Tel: 314-725-8088. Fax: 314-725-1419. Web: www.wincowindow.com.

B. Requests for substitutions will be considered

2.2 MATERIALS

A. Aluminum:
1. Frame: Extruded aluminum, 6063-T6 alloy and temper, tensile strength of 25,000 psi.
2. Ventilator: Extruded tubular aluminum, 6063-T6 alloy and temper, tensile strength of 25,000 psi.

2.3 THERMAL PROJECTED/FIXED WINDOWS – WINCO 1450 SERIES

A. Acceptable Product:
1. Winco 1450 Series: 4 inch Heavy Commercial Thermally Improved Window.

B. Performance: AAMA/WDMA/CSA 101/I.S.2/A440.
1. Architectural Window: AW-100.
2. Heavy Commercial: HC-100.
3. Water Resistance, ASTM E 331: 12 psf (575 Pa).
4. Water Resistance, ASTM E 547: 12 psf (575 Pa) for AW rated windows.
5. Air Infiltration, ASTM E 283 at static air pressure of 6.24 psf: 0.02 cfm/sf.
6. Uniform Load Structural Test, ASTM E 330: 150 psf (5748 Pa).
7. Forced Entry Resistance, ASTM F 588: Grade 10.
8. Condensation Resistance Factor (CRF), AAMA 1503.1: Frame: 68
9. Thermal Performance ("U" Value), AAMA 1503.1: 0.45 BTU/Hr-F°-Ft^2.

C. Frame: Thermally broken.

1. Wall Thickness: 0.125 inches (3.175 mm)
2. Depth: 4 inches (102 mm).
3. Corners: Closely fit and mechanically fastened with screws. Must be sealed using AAMA approved sealants in a multi-step process to provide sealant redundancy.
4. Leg: Provide equal leg frame.

D. Ventilator and Access Sash: Thermally broken.
1. Wall Thickness: 0.125 inches (3.2 mm).
2. Ventilator Depth: 2 inches (51 mm).
3. All vent extrusions shall be tubular on all 4 sides.
4. Corners: Mitered and assembled by means mechanical fastening with screws. Joinery is sealed with AAMA approved small joint sealant.
5. Each vent shall have two rows of Santoprene® weather stripping installed in a specifically designed weather strip pocket for the extrusion.

E. Weather Strip
1. All weather strips shall be double Santoprene® thermos plastic rubber or equal.

F. Thermal Barrier
1. Poured-in-place structural thermal barrier shall transfer during bending and provide composite action between frame components.
2. Thermal barrier pocket on aluminum extrusions shall be Azo-Braded to create a mechanical lock to improve the adhesion properties between the polyurethane polymer and the surface of the thermal barrier pocket.
3. Window manufacturer must provide a warranty from the manufacturer of the polyurethane thermal barrier that warrants against product failure as a result of thermal shrinkage beyond 1/8 inch (3.2 mm) from each end and fracturing of the polyurethane for a period not to exceed ten years from the date of window manufacture.
4. Thermal barriers made of crimped in place polyamide (insulbar®) strips are not acceptable unless all strips are covered and tooled with Dow 795 silicone caulking to climate water migration.

2.4 HARDWARE

A. Locks:
1. Cam type locking handles; white bronze alloy with US25D brushed finish.
2. Casement lock (multi-point lock).

B. Simulated Double Hung Window: Provide all components for a complete double hung reproduction window.
1. Basis of Design Product: Winco Heavy Commercial Thermally Improved Simulated Double Hung Reproduction Window.

C. Blind Sash Fasteners: Stainless steel ramp clamp secured with minimal fasteners.

D. Hinged Sash Supports: Stainless steel four bar arms.

E. Handle: Pull handle.

F. Hold Open: Hold open arms.

G. Push Bar: Under screen push bar.

2.5 TRIM AND PANS

A. Provide trim and pans to match existing style and function.

B. Sub Frame and Closure Plate.

C. Sill Starter.

D. Sub-Sill

E. Sill Extension

F. PVC Comp. Channel (Frame Filler): For frame depth.

G. Strap Anchor.

H. Snap Cover

I. Base Clip

J. Replacement Pan Systems

K. Blast Tested Trim
   1. Blast Receptor: Blast receptor with exterior installed closure plate.
   2. Blast Snap Trim: 2 inch by 2 inch (51 mm by 51 mm).
   3. Blast Snap Trim: 2 inch by 1-1/4 inch (51 mm by 38 mm).

2.6 SCREENS

A. Frame: Extruded aluminum, 6063-T6 alloy and temper.
   1. Screen mounting holes shall be pre-drilled at the factory

B. Screen Fabric: 0.011 inch (0.2194 mm) diameter 5154 alloy wire woven in 18 x 16 mesh.
   1. Color: Charcoal anodized.

C. Screen Fabric: 0.009 inch (0.2286 mm) diameter stainless steel wire woven in 18 x 16 mesh.

2.7 BLINDS

A. Head Rail: 1.085 inch wide by 0.875 inch high by 0.050 inch thick (27 mm by 22 mm by 1.3 mm).

B. Bottom Rail: 1 inch wide by 0.355 inch high by 0.050inch thick (25 mm by 9 mm by 1.3 mm).

C. Rail Material: 6063-T5 extruded aluminum alloy and temper with a baked on polyester powder coat finish conforming to AAMA 603.8-1985.

D. Ladder Cord Locations: Shall not exceed 6 inches (152 mm) from end of the slot or 24 inches (610 mm) apart.

E. Tilt Control: Tilt control knob shall have slip feature to minimize damage due to over tilting of blind.

F. Tilt Control: Provide angled tilt control knobs.

G. Knobs: Provide Thumb turn knobs.

2.8 MULLIONS AND GRIDS

A. Mullion:
   1. Thermal Mullion
   2. Blast Resistant Mullion in accordance with UFC 4-010-01.
      a. Maximum Deflection: L/60.
      b. Static Pressure: 1 psi (0.07 kg/cm).
   3. Provide mullions as indicated on Drawings.

2.9 FINISH

A. Paint Finish: Finish all exposed areas of aluminum windows and components with the following:
   1. 70 percent Kynar in accordance with AA-M12-C42-R1X, AAMA 2605-98
   2. Color: To be selected by the Architect from the manufacturer's standard colors.

2.10 GLAZING

A. Refer to Section 08800, Glazing: Glass and installation.

B. Glazing: All units shall be factory glazed with butyl tape, silicone cap bead on the exterior, with glazing vinyl and extruded snap-in aluminum glazing bead on the interior.

C. Glass Type: Insulating.

D. Glass Type: UL Level 3 Ballistic rated

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Final operating adjustment shall be made after glazing work is complete. Operating sash and ventilator shall operate smoothly and shall be weathertight when in locked position

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 8000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Aluminum storefront doors and framing.
   2. Interior doors.
   3. Security glazing in holding cell doors.
   4. Ballistic glass (at transaction windows and select exterior windows)

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product. 12 inches square.

C. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: “Laminated Glazing Reference Manual" and "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

E. Safety Glazing Labeling: Permanently mark glazing with certification label of the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

F. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

2.2 GLASS PRODUCTS

A. Types:
1. Clear Tempered Glass: Indicated on Drawings as "Tempered" glass; ¼ inch thick, clear tempered glass; Provide where indicated on the Drawings;
   a. "Tempered Glass" by Vitro
   b. "Tempered Glass" by McGrory Glass
   c. "Tempered Glass" by Guardian Glass.

2. Clear Insulating Low-E Glass: Indicated on Drawings as “insulated” consisting of an exterior side of 1/4” clear glass and an interior side of 1/4” clear glass. Glass shall be separated by a spacer and be hermetically sealed using double seal organic sealants. Low E coating on #2 surface. Unit thickness including ½-inch air space shall total 1 inch.
   a. “Solorban 60 - Clear” by Vitro
   b. “LoĒ²-272” by Cardinal Glass
   c. “Sun-Guard SN-68” by Guardian Glass
   d. or equal products of alternatives of the quality necessary to meet the specifications.

   Provide at locations indicated except where safety glass is required by CPSC 16 CFR 1201;

B. Provide heat-strengthened glass at locations where recommended by the glass manufacturer.

C. Provide safety glass as specified in locations where required by Consumer Product Safety Commission "Safety Standard for Architectural Glazing Material" (16 CFR 1201.)

2.3 SECURITY GLAZING (DOORS 120.2 & 120.3)

A. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on exposed surfaces and Type I, standard, UV-stabilized polycarbonate where no surfaces are exposed.

B. Laminated Polycarbonate: Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C 1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Provide laminated units that comply with requirements of ASTM C 1349 for maximum allowable laminating process blemishes and haze.

C. Glass-Clad Polycarbonate: ASTM C 1349, and other requirements specified.
   1. Provide glass-clad polycarbonate that complies with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified.
   2. Forced Entry Resistance: H.P. White TP-0500.01 Level 1, or ASTM F1915 Grade 4.
   3. Overall Nominal Thickness: 9/16 inch.
   4. Color: Clear.
   5. Available Products:
      a. Secure-Tem + Poly 2117 by Global Security Glazing.
      b. ICGCP 916 CS by Standard Bent Glass.
      c. 9/16” ArmorProtectPlus by Oldcastle Glass.
      d. D-FenceGlas DFG 9/16 by North American Specialty Glass.
      e. DGCP562 by Dlubak Corp.

2.4 BALLISTIC GLAZING

A. Polycarbonate Sheet:

B. Laminated Polycarbonate:
   1. Provide laminated polycarbonate that complies with testing requirements in UL Standard 752, Level 3
   2. Glazing shall be constructed of polycarbonate core with additional polycarbonate layers on each side of glazing.
   3. Overall Nominal Thickness: 3/4 inch minimum.
   4. Color: Clear.
   5. Available Products:
      a. BULLETBLOCK MP750 by Insulguard Security Products
      b. Laminated Polycarbonate Glass by Total Security Solutions
      c. BallisticDefend™ 1-GCP by McGrory Glass

2.5 GLAZING SEALANTS

A. Glazing gaskets for glass set in aluminum shall be elastomeric extrusions provided by the aluminum system manufacturer.

B. Glazing Gaskets for Interior panes: Closed cell neoprene.

C. Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:Glazing for interior work shall be butyl-polyisobutylene preformed sealant tape, aluminum color, size as required for installation, 440 Tape as manufactured by Tremco, or approved equal.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 8000

SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product provide:
1. Manufacturer's Installation Instructions.
2. Product data describing standard framing members, materials and finish, product criteria, load charts, and limitations.

B. Shop Drawings: Provide drawings to indicate:
1. Prefabricated work, component details, framed openings, anchorage to structure, type of fasteners, and accessories or items required of other related work.
2. Description method of securing studs to tracks, splicing, and for blocking and reinforcement to framing connections.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.

B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

A. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.

1. Minimum Base-Metal Thickness: 20 ga, 0.033 inch (0.84 mm) unless otherwise noted on drawings.
2. Depth: As indicated on Drawings

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dale Industries, Inc.

2) Dietrich Industries, Inc.

3) Marino/Ware (formerly Marino Industries Corp.).

4) National Gypsum Co.; Gold Bond Building Products Division.

5) Unimast, Inc.

B. Slip-Type Head Joints: Provide the following track at the underside of floor structural system in thickness not less than indicated for studs and in width to accommodate depth of studs:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; Slotted Deflection Track.
3) Steel Network Inc. (The); VertiTrack VTD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).
5) Telling Industries; Vertical Slip Track

C. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following [available products that may be incorporated into the Work include, but are not limited to, the following]:

a. Fire Trak Corp.; Fire Trak System[attached to studs with Fire Trak Posi Klip].
b. Grace Construction Products; FlameSafe FlowTrak System.
c. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm)

E. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth1-1/2 inches (38 mm)
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch
2. Depth: As indicated on Drawings

G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: hat shaped

H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E 488.

a. Type: Cast-in-place anchor, designed for attachment to concrete forms or Postinstalled, expansion anchor

2. Powder-Actuated Fasteners: Capable of sustaining, a load equal to 10 times that imposed as determined by ASTM E 1190.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet 1 by 3/16 inch (25 by 5 mm) by length required.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.

    a. Minimum Base-Metal Thickness: 20 ga., 0.033 inch (0.84 mm)].
    b. Depth: As indicated on Drawings

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

    a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm)

4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

    a. Configuration: hat shaped

2.4 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

2. United States Gypsum Construction Handbook, Sixth Edition for industry standard assemblies.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Control Joints: Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently. Control Joint spacing shall be:
1. 30-ft o. c. max
2. Provide layout of typical control joint locations for architect Review and approval.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
3. Do not attach hangers to steel roof deck.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 2216

SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Accessories.

B. Related Requirements:
1. Section 09 2216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corp.
2. Georgia-Pacific Gypsum LLC.
3. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch unless indicated otherwise on Drawings.
2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 1.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Green Glue Noiseproofing Sealant, Green Glue
   b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corporation.
   c. SHEETROCK Acoustical Sealant; USG Corp., United States Gypsum Co.

F. Thermal Insulation: As specified in Section 07 2100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite

sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.
4. Abuse-Resistant Type: Meet/Train/Em Ops 202 in Police Building, Gear 217 in Police Building, Armory 218 in Police Building.

5. Moisture- and Mold-Resistant Type: All Shower and Locker Rooms except at locations indicated to receive tile.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings and as required for a complete installation.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 09 9100 "Painting."

4. Level 5: Conf./Caucus Room 118- Plan West.

    a. Primer and its application to surfaces are specified in Section 099100 "Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 2900

SECTION 09 3000 – CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Ceramic mosaic tile
   2. Ceramic tile base
   3. Ceramic wall tile
   4. Ceramic floor tile
   5. Metal thresholds
   6. Waterproof membrane
   7. Cleavage membrane
   8. Crack isolation membrane
   9. Metal edge strips

B. Related Sections:
   1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   2. Division 09 Section "Gypsum Board" for cementitious backer units and glass-mat, water-resistant backer board.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Module Size: Actual tile size plus joint width indicated.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

B. Samples:
1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Metal edge strips in 6-inch lengths.

C. Product Certificates: For each type of product, signed by product manufacturer.

1.6 QUALITY ASSURANCE

A. Tile Council of America, Inc., "Handbook for Ceramic Tile Installation," latest edition;

B. American National Standards Institute (ANSI) "American National Standard Specifications for Ceramic Tile - ANSI-137.1."

C. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

E. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Waterproof membrane.
2. Crack isolation membrane.
3. Joint sealants.
4. Cementitious backer units.
5. Metal edge strips.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed for each type, composition, color, pattern, and size indicated but no less than one carton of each type and color. Box for storage, date, and mark the box "maintenance tile".

C. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Manufacturers:
   1. Basis of Design: Daltile.
   2. Acceptable Alternatives: American Olean and Garden State.

B. Ceramic Tile Flooring (indicated on the Drawings as “PFT")
   1. Size: As indicated on Drawings.
   2. Color: As indicated on Drawings.
   3. Thickness: 3/8 inch.
   4. Provide trim shapes as required.

C. Ceramic Wall Tile (indicated on the Drawings as “CWT")
   1. Size: As indicated on Drawings.
   2. Color: Varies depending on type, refer to drawings for basis of design.
   3. Thickness: Varies depending on type, refer to drawings for basis of design.
   4. Provide trim shapes as required.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Threshold: Refer to drawings for locations of material transition.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 40 mil nominal thickness.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Noble Company (The); Nobleseal “Chloraloy 240”

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for heavy duty performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 30 mil nominal thickness.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Noble Company (The); Nobleseal CIS.

2.6 CLEAVAGE MEMBRANE

A. Cleavage Membrane: 15 pound roofing felt ASTM D 226, for use under full set tile locations on slab on grade, unless other material is indicated on the Drawings or specified.

2.7 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. MAPEI Corporation.
      b. Bonsal American; an Oldcastle company.
      c. Bostik, Inc.
      d. Laticrete International, Inc.

   2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
   3. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
   4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Basis-of-Design Product: Subject to compliance with requirements, provide “Classic Collection” and “Designer Series” as manufactured by MAPEI Corporation or comparable product by one of the following:
    a. MAPEI Corporation.
    b. Bonsal American; an Oldcastle company.
    c. Laticrete International, Inc.
    d. Southern Grouts & Mortars, Inc.
    e. Summitville Tiles, Inc.
2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.9 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
    1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
    1. Products: Subject to compliance with requirements, provide the following or approved equal:
        a. Dow Corning Corporation; Dow Corning 786TR-WHT.

2.10 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

    1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
    2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments. Use bullnosed shapes to terminate tile except at inside corners.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Align joints where adjoining tiles on floor, base, walls, and trim are the same size.
   3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

   1. Ceramic Mosaic Tile and Cove Base: 1/8 inch.
   2. Wall Tile: Per manufacturer’s written instruction.

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings and as follows. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where tile floors abut vertical surfaces such as bases, walls, curbs, etc., provide 1/4 inch wide control joints, full depth through the ceramic tile and under bed, to receive control joint sealant.
   2. At building control points, between ceramic tile and metal door frames and between ceramic tile and marble thresholds.
   3. Control joints shall also be located directly over joints in concrete slabs. Joints shall be in accordance with the "Handbook for Ceramic Tile Installation" of the Tile Council of America, EJ171-06. Base/cove installation shall be "Flush" as indicated in the "Handbook for Ceramic tile Installation."
   4. All control joints shall be left open, protected and maintained clean to receive the control joint sealant and backing.
   5. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and hazes from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after

determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 TILE INSTALLATION SCHEDULE

A. Ceramic tile installation shall be in accordance with the following methods from the “Handbook For Ceramic Tile Installation," of the Tile Council of America, Inc., Latest Edition:

1. Thin-set floor: F113 with wet-cured, Latex-Portland cement/sand grout (1 pc = 1 sand) with crack protection sheet;
2. Thin-set, wall: W243.

B. All work shall be laid out to minimize cutting. Where cutting is required, tile shall be neatly cut and fitted with edges ground smooth.

C. Reinforce setting beds over waterproofing and cleavage membranes with the specified mesh reinforcing. Do not install tile floors over membrane until the membrane has been tested and accepted.

D. Apply silicone sealant at top edge of ceramic and quarry base between wall surface and base.

E. Use a grout release coating product as approved by the tile manufacture.

F. Limits of tile:

1. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption.
2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.
3. Use bullnose shapes to terminate tile except at inside corners.

END OF SECTION 09 3000

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings, wire hangers, main runners, fasteners, and wall angle moldings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Evaluation reports.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Warranty

1. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

A. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.

B. Grid System: Rusting and manufacturer's defects

C. Acoustical Panels designated as inherently resistive to the growth of micro-organisms installed with suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Maintenance data.

C. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP.

B. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

B. Acoustical Panel Standard: Comply with ASTM E 1264.

C. Metal Suspension System Standard: Comply with ASTM C 635.

D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.3 ACOUSTICAL PANELS

A. Type 1 [As indicated on Drawings]
   1. Armstrong World Industries, Inc: Subject to compliance with requirements, provide “Ultima Lay-In, Beveled Tegular #1911” or comparable product by one of the following:
      a. CertainTeed Corp.
      b. Chicago Metallic Corporation.
      c. USG Interiors, Inc.; Subsidiary of USG Corporation.

2. Composition: Mineral Fiber
3. Classification: 15/16” Beveled Tegular
4. Color: White
5. LR: 88%
6. NRC: .75
7. CAC: 35
8. Thickness: 3/4 inch
9. Modular Size: 24 inches by 24 inches.

B. Type 4 & Type 6 [As indicated on Drawings]
1. Armstrong World Industries, Inc: Subject to compliance with requirements, provide “Optima Square Tegular #3255” or comparable product by one of the following:
   a. CertainTeed Corp.
   b. Chicago Metallic Corporation.
   c. USG Interiors, Inc.; Subsidiary of USG Corporation.
2. Composition: Fiberglass
3. Classification: 15/16” Square Tegular
4. Color: White
5. LR: .88
6. NRC: .95
7. Thickness: 1 inch
8. Modular Size: 48 inches by 48 inches.

C. Type 7 [As indicated on Drawings]
1. Armstrong World Industries, Inc: Subject to compliance with requirements, provide “Ultima Lay-In, Beveled Tegular #1914” or comparable product by one of the following:
   a. CertainTeed Corp.
   b. Chicago Metallic Corporation.
   c. USG Interiors, Inc.; Subsidiary of USG Corporation.
2. Composition: Mineral Fiber
3. Classification: 15/16” Beveled Tegular
4. Color: White
5. LR: 88%
6. NRC: .75
7. CAC: 35
8. Thickness: 3/4 inch
9. Modular Size: 24 inches by 48 inches.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS

A. Armstrong World Industries: Subject to compliance with requirements, provide “Prelude XL, 15/16”, or comparable product by one of the following:
1. CertainTeed Corp.
2. Chicago Metallic Corporation.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated,

or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 9/16-inch- (15-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush
4. Cap Material: Steel -rolled sheet.
5. Cap Finish: Painted white.

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

B. Proper design for both supply air and return air, maintenance of the HVAC filters and building interior space are essential to minimize soiling. Before starting the HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer’s instructions for installation and comply with the intent of the architects drawings.

B. Deliver ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

C. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way

E. Cut wood panel edges that are exposed to view will have to be treated to look like factory edges. Pre- finished peel and stick edge banding is recommended for this purpose

F. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

G. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
1. Ceiling Touch-Up Paint, "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 5113

SECTION 095426 - SUSPENDED WOOD CEILINGS

PART 1 - GENERAL

1.1 STIPULATIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood Ceilings
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Sections

1. Section 09 20 00 - Gypsum Board
2. Section 09 22 16 – Non-structural Framing
3. Division 23 (15) – HVAC Air Distribution
4. Division 26 (16) – Electrical Work

1.3 COORDINATION

A. Coordinate layout and installation of wood ceilings and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product

B. Layout and details of woodworks grille ceilings. Show locations of items which are to be coordinated with or supported by the ceilings.

C. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each woodworks grille panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency

B. Evaluation Reports: For each woodworks grille panel ceiling suspension system and anchor and fastener type, from ICC-ES.

C. Field quality-control reports

D. Shop Drawings: For suspended wood ceilings.

1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:

a. Wood ceiling patterns and joints.
b. Ceiling suspension members.
c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
e. Ceiling perimeter and penetrations through ceiling; trim and moldings.

1.6 CLOSEOUT SUBMITTALS

A. Warranty

1. Woodworks Grille panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

a. Ceiling: Defects in materials or factory workmanship.

b. Grid System that is rusting with manufacturer's defects

2. Warranty Period:

1. Wood Ceiling System: One 10 years from date of Final Completion.

1.8 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer to ensure fit and function.

B. Installer Qualifications: Company specializing in performing specified work type, a minimum of three years of documented experience, and approved by the manufacturer.

C. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

D. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 Classification.

E. HPVA (Hardwood Plywood and Veneer Association) certification and audit program per ASTM E-84 tunnel test.

F. Woodworking Standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.

G. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

1. Store materials flat and level, raised from the floor.

B. Do not store in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees F or greater than 86 degrees. Panels must not be exposed to extreme temperatures, for example, close to a heating source or near a window with direct sunlight.

C. Handle ceiling components and accessories in a manner that prevents damage.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

1. Store and acclimatize wood products in the spaces where they will be installed for a minimum of 72 hours immediately before ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Criteria: Provide suspended wood ceilings designed and installed to withstand the effects of earthquake motions in accordance with ASTM E580/E580M and requirements of authorities having jurisdiction.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A in accordance with ASTM E1264.
2. Smoke-Developed Index: 50 or less

2.3 SUSPENDED WOOD CEILINGS

A. Acoustical Wood Ceilings

3. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Woodworks Grille or comparable product by one of the following:

   a. Rulon
   b. USG Corporation
   c. or equal as approved by the Professional

4. Location: Type 2 as noted on drawings.
5. Composition: Solid Wood
6. Finish: Plain Slice Walnut
7. Acoustical Backing: BioAcoustic Infill Panel (Black- Matte) or equal as specified by manufacturer.
8. Dimensions: As noted on the drawings
9. Accessories: Manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.

   a. Safety Clips: Manufacturer's standard to prevent panels from dropping when disengaged from the suspension system.
   b. Safety Cables: Manufacturer's standard to prevent panels weighing 20 lb or more from falling to floor in event of grid failure.
   c. Border Clips: Manufacturer's standard screw-attached type.
   d. Grid-Stabilizer Clips: Manufacturer's standard for oversize panels.
   e. Panel-Fixing Clip or Bracket: Manufacturer's standard that positively secures border and cut panels to the suspension system, so they cannot be removed from below.

2.2 METAL SUSPENSION SYSTEM

A. Armstrong World Industries: Subject to compliance with requirements, provide “Prelude XL, 15/16” Exposed Tee 12’ Main Beam, 4’ Cross Tee, 2’ Cross Tee, or comparable product by one of the following:

   a. USG Corporation
   b. Celotex
   c. or equal as approved by the Professional

1. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

   a. Structural Classification: ASTM C 635 Intermediate or Heavy Duty.

2. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
3. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

4. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as used for exposed flanges of suspension-system runners.
6. Accessories: as required by manufacturer.
5. Location: Type 2 as noted on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

B. Examine substrates, areas, and conditions, including structural framing and substrates to which suspended wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and with requirements for installation tolerances and other conditions affecting performance of suspended wood ceilings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of suspended wood ceilings.

1. Balance border widths at opposite edges of each ceiling.
2. Avoid using less-than-half-width units.

3.3 INSTALLATION OF SUSPENDED WOOD CEILING

A. Comply with ASTM C636/C636M and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in 3 inches. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts**,** power-actuated fasteners**,** or postinstalled mechanical or adhesive anchors that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns in 1-1/2 inches. Suspend bracing from building's structural members as required for hangers and without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim at perimeter of ceiling area and where necessary to conceal edges and ends of wood units.

1. Screw-attach metal moldings to substrate at intervals of not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 ft.. Miter corners accurately and connect securely.
2. Do not use exposed fasteners on moldings and trim.

E. Grid Suspension Systems: Space main beams at 48 inches o.c.

1. Install cross tees to form modules sized in accordance with manufacturer's written installation instructions.
2. Remove and replace dented, bent, or kinked members.

F. Linear-Carrier Suspension Systems: Install carriers at no more than 24 inches o.c. aligned and securely interlocked with one another.

1. Install stabilizer channels, tees, and bars at regular intervals to stabilize carriers and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated.
2. Remove and replace dented, bent, or kinked members.

G. Install wood components and accessories in accordance with manufacturer's written instructions and to accommodate natural expansion and contraction of wood products resulting from fluctuations in humidity.

H. Cut wood components for accurate fit at borders and at interruptions and penetrations by other work through ceilings.

1. Stiffen edges of cut wood components as required to eliminate variations in flatness.

I. Treat field-cut edges of wood components in accordance with manufacturer's written recommendations; finish exposed field cuts to match factory finish.

1. Solid-Wood Planks: Use solid-wood end caps to conceal exposed field-cut edges.

J. Install wood components in coordination with suspension system and moldings and trim.

1. Install wood components in patterns indicated on Drawings.

K. Install field-constructed access panels in locations indicated on Drawings.

3.4 CLEANING

A. Clean exposed surfaces of ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented units.

B. Replace damaged and broken panels.

END OF SECTION 095426

SECTION 09 5753 - SECURITY CEILING ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Security-plank security ceiling assembly.
   2. Security ceiling lighting, access panels & accessories

1.2 COORDINATION

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

A. Product Data:
   1. Security-plank security ceiling assembly.
   2. Security ceiling lighting, access panels & accessories

B. Samples: For security ceiling panel units and suspension system.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product test reports.

C. Attachment device test reports.

D. Research reports.

E. Field quality-control reports.

F. Anchor inspection reports.

G. Field quality-control certification signed by Contractor

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Acoustical Performance: Provide security ceiling assemblies with acoustical ratings indicated, as determined in accordance with ASTM E1264 and the following:

1. Noise Reduction Coefficient (NRC): ASTM C423-84a and ASTM E795-83 in Type E-400 mounting.
2. Ceiling Attenuation Class (CAC): ASTM E1414/E1414M.

2.2 SECURITY-PLANK SECURITY CEILING ASSEMBLY

1. Basis of Design
   a. Provide Basis of Design product – “Cel-Line Metal Plank Acoustical Security Ceiling System”, and associated ‘Cel-Lite’ Lighting fixtures, by Gordon, Inc. (Bossier City, LA 71111), or equal, as reviewed and approved by the Architect.
2. Steel Panels: Metallic-coated 14 gauge steel
3. Panel Width: [24 inches].
4. Panel Length: [Minimum 12 feet].
5. Perforation Pattern: [Manufacturer's standard]
6. Noise Reduction Coefficient (NRC): [0.85]
7. Light Fixtures: 12”x48” recessed light fixtures, by the same manufacturer as the security ceiling.
8. Access Panels: 2’x2’ min hinged access door with heavy duty lock, by the same manufacturer as the security ceiling.

B. Sound-Absorptive Pads: Provide sound-absorptive pads for placement over ceiling planks.

1. Spacer Grids: Metallic-coated-steel grid units.
2. Support Clips: Metal clips.

C. Backer Plates: Unperforated units formed from metallic-coated steel sheet that reduces travel of sound through panel and that makes panel assembly comply with the following performance:

1. Ceiling Attenuation Class (CAC): [40]
2. Sound-Absorptive Pads: Provide secondary sound-absorptive pads, same as specified for primary pads, for placement over backer plates to reduce plenum sound.

D. Access Panels: Material, perforation pattern, and finish same as security ceiling panels. Provide at [locations indicated by Design team, to coordinate with above ceiling equipment]

E. Closures: Fabricated from minimum 0.053-inch- (1.34-mm-) thick steel sheet, finished to match security ceiling panels. Fasten with security fasteners or by welding.

F. Perimeter Supports: Wall-mounted angles, tees, and bearing plates.

1. Steel Perimeter Supports: [Metallic]-coated 14 gauge steel, finished to match security ceiling panels.

G. Exposed Edge Moldings and Trim: Provide exposed members as indicated or required for edges of security ceiling, fixture trim, beams, fasciae at changes in security ceiling height, and other conditions, of metal and finish matching security ceiling panels.

2.3 SOUND-ABSORPTIVE PADS

A. Plastic-Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, vinyl chloride plastic sheet encapsulating unfaced mineral-fiber insulation.

2.4 METALLIC-COATED STEEL SHEET FINISHES

A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: [As selected by Architect from manufacturer's full range]

2.5 STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: [As selected by Architect from manufacturer's full range]

2.6 SECURITY FASTENERS

A. Security Fasteners for Ceiling Assemblies: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener.

2.7 SECURITY SEALANTS

A. Polyurethane Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement.

B. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.

C. Acoustical Sealant: Manufacturer's standard, nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.

2.8 ACCESSORIES

A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welding.

C. Attachment Devices: Size for [five] times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements.

B. Inspect built-in and cast-in anchor installations before installing security ceiling assemblies to verify that anchor installations comply with requirements.

3.2 GENERAL INSTALLATION

A. Comply with CISCA's "Ceiling Systems Handbook" for installation of security ceiling assemblies.

B. Install perimeter supports around perimeter of security ceiling area.

1. Sealant: Apply [polyurethane security] [epoxy security] sealant in a continuous ribbon concealed on back of vertical legs of supports before they are installed.
2. Attach supports with anchor bolts or expansion anchors spaced not more than 12 inches (305 mm) o.c. and not more than 3 inches (76 mm) from ends. Miter corners accurately.

    a. Level perimeter supports with suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.7 m).

3. Do not use exposed fasteners, including pop rivets, on moldings and trim. If exposed fasteners are unavoidable, obtain prior written approval from Architect for their use and use security fasteners.

C. Install accessories where indicated and as required to comply with performance requirements.

1. Sound-Absorptive Pads: For security ceiling panels indicated, provide sound-absorptive pads of width and length to completely fill inside of each security ceiling panel.

    a. Install sound-absorptive pads over metal spacer grids

2. Backer Plates: Install plates in areas indicated on reflected ceiling plans or in room finish schedules. Lay backer plates directly on security ceiling assembly in manner indicated and close major openings to form complete coverage in required areas. Lay second sound-absorptive pad on backer plate.

3.3 INSTALLATION OF SECURITY-PLANK SECURITY CEILING ASSEMBLY

A. Install security planks with long edges continuously interlocked. Adjust security planks to final position before permanently fastening. Provide minimum 1-1/2-inch (38-mm) end bearing.

1. Attach adjacent security planks to each other with security fasteners spaced not more than 12 inches (305 mm) o.c. and not more than 6 inches (152 mm) from ends.
2. Attach ends of security planks to perimeter supports with security fasteners not more than 3 inches (76 mm) from edges of security plank. Fasten through exposed face of supports into security planks.
3. Provide intermediate carriers for ends of security planks that are not supported by perimeter supports. To attach security planks to intermediate carriers, use same method as that used for attaching security planks to perimeter supports.

    a. Support intermediate carriers from structure above by secondary support system spaced at 48 inches (1220 mm) o.c. and bolted to carriers.

B. Access Panels: Install each access panel within one security plank. Coordinate locations in field with above ceiling equipment.

C. Provide steel angle reinforcement on each side of openings that exceed 12 inches (305 mm) in any direction.

3.4 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

END OF SECTION 09 5753

SECTION 096516 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 STIPULATIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sheet flooring with backing.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient sheet flooring.

1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples for Verification Purposes: Submit samples of each type, color, and pattern of resilient flooring required, showing full range of color and pattern variations specified, in manufacturer's standard size, but not less than 6 inch by 9-inch sections.

D. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives and sealants and leveling compounds.

B. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturers for resilient sheet flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturers for installation techniques required.
2. Installer Qualifications: Installers experienced in performing work of this section who specialize in installations required for this project.

C. Bond Test: Install multiple bond tests using 3' x 3' pieces of material adhered with the appropriate adhesive to verify quality of adhesion. Remove half of each piece after 24 hours, then the other half after 48 hours. To help assess resistance to indentation, place end user equipment onto a sample for 72 hours. Document all results.

DELIVERY, STORAGE, AND HANDLING

D. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 68 deg F or more than 80 deg F. Store rolls upright.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 68 deg F or more than 80, in spaces to receive resilient sheet flooring during the following periods:

1. 72 hours before and during installation.
2. 24 hours after installation.

B. Close spaces to traffic during resilient sheet flooring installation.

C. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

D. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RF-01 RUBBER SHEET FLOORING WITH BACKING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Mannington Reset or equal by comparable of the following:

1. Tarkett
2. Polyflor

B. Product Standard: ASTM F1303.

1. Type (Binder Content): Type 1
2. Overall Thickness: 9.0 mm.
3. Composition: Recycled Rubber Sports Flooring
4. Roll Dimensions: 4’ x 50’
5. Adhesive: Per manufacturer’s written instructions
6. Colors and Patterns: Gray Tones 827

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Comply with manufacturer's product data, including product technical bulletins, product catalog, and installation instructions.

3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9

pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not proceed with work until results of moisture condition tests are acceptable.

E. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.
5. Adhere sheet vinyl to substrate.
6. Mechanically fasten all perimeter edges and penetrations.

D. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

F. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

G. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints,

telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient sheet flooring until Final Completion.

E. No traffic for 24 hours after installation.

F. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation. Wait 72 hours after installation before performing initial cleaning.

END OF SECTION 096516

SECTION 09 6500 - RESILIENT TILE FLOORING & ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Luxury Vinyl Tile (LVT).
   2. Rubber wall base.
   3. Resilient molding accessories.

1.3 SUBMITTALS

A. Product Data:
   1. Material list of items proposed to be provided under this section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended preparation and installation procedures used on this work.

B. Maintenance Data: For each type of floor tile to include in maintenance manuals.

C. Samples: Sample of each item specified in all colors and patterns available in the specified grades from the proposed manufacturers.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/cm².

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

B. Store floor tiles on flat surfaces.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before, during and after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic for 48 hours after floor tile installation.

D. Install floor tile after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

   2. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT MATERIALS

A. Luxury Vinyl Tile (“LVT-01”
   1. Nominal Dimensions: As indicated on Drawings.
   2. Basis-of-Design Product:
      a. Shaw Contract Function 5.0 4388v.
   3. Alternative products shall be pre-approved.
   4. Class / ASTM F1700: Class III.
   5. Wear Layer Thickness: 22mil.
   6. Total Thickness: 5 mm.
   7. Installation: Manufacturer’s recommended adhesive.
   8. Static Load Limit (ASTM F970): 1500 lbs.
   9. Residual Indentation (ASTM F1914): Passes.
   10. Resistance to Heat (ASTM F1514): Passes.
   11. Resistance to Light (ASTM F1515): Passes.
   12. Resistance to Chemicals (ASTM F925): Passes.
   13. Radiant Panel (ASTM E648): Passes, Class I

14. Coefficient of Friction (ASTM D2047, Slip Resistance): Meets the recommended static coefficient of friction for ADA walking surfaces.
15. Warranty: 15 year from Substantial Completion.
16. Colors/Patterns: Refer to Drawings.

B. Luxury Vinyl Tile ("LVT-02")
1. Nominal Dimensions: As indicated on Drawings.
2. Basis-of-Design Product:
   a. Shaw Contract Eon 4112V.
3. Alternative products shall be pre-approved.
4. Class / ASTM F1700: Class III.
5. Wear Layer Thickness: 22 mil.
6. Total Thickness: 5 mm.
7. Installation: Manufacturer's recommended adhesive.
8. Static Load Limit (ASTM F970): 1000 lbs.
9. Residual Indentation (ASTM F1914): Passes.
10. Resistance to Heat (ASTM F1514): Passes.
11. Resistance to Light (ASTM F1515): Passes.
12. Resistance to Chemicals (ASTM F925): Passes.
13. Radiant Panel (ASTM E648): Passes, Class I
14. Coefficient of Friction (ASTM D2047, Slip Resistance): Meets the recommended static coefficient of friction for ADA walking surfaces.
15. Warranty: 15 year from Substantial Completion.
16. Colors/Patterns: Refer to Drawings.

C. Rubber Wall Base ("WB-01")
1. Dimension: 1/8" thick by height indicated on the drawings.
2. Type: Standard Toe- Cove
3. Corners: Job formed.
4. Colors: As indicated on the drawings.
   a. Roppe Corporation, USA.
   b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   c. Johnsonite.

2.2 RESILIENT MOLDING ACCESSORY

A. Provide accessory moldings, (i.e. Nosing for carpet, resilient floor covering, reducer strips, transition strips etc.) whether indicated or not on the Drawings and as required for a complete installation.

B. Material: Rubber.

C. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 LUXURY VINYL TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RUBBER BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of resilient floor covering that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 09 6500

SECTION 09 6723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resinous broadcast flake flooring.

2. Resinous flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each resinous floor system required and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flammability: Self-extinguishing in accordance with ASTM D635.

2.2 RESINOUS BROADCAST FLAKE FLOORING [EPX-01 as indicated on drawings]

A. Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.

1. Acceptable Manufacturers:
   a. Durex Coverings (Basis of Design)

b. Industrial Floor Corporation
c. Palma Inc.

B. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range

2. Wearing Surface: Textured for slip resistance

3. Overall System Thickness: 3/16 inch

4. Products:
a. Durex Coverings DymaFlake (Basis of Design)
b. Industrial Floor Corporation Sanseam Epoxy Vinyl Flake Flooring
c. Palma Inc. PaliKrom 185 Colored Quartz Epoxy Flooring

5. Formulation Description: 100 percent solids

2.3 RESINOUS FLOORING [SC as indicated on drawings]

A. Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor.

1. Acceptable Manufacturers:
a. Durex Coverings (Basis of Design)
b. Industrial Floor Corporation
c. Palma Inc.

B. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range

2. Wearing Surface: Textured for slip resistance

3. Overall System Thickness: 3/16 inch

4. Products:
a. Durex Coverings Impax Floor (Basis of Design)
b. Industrial Floor Corporation Poxeplate Epoxy Floor Coating System
c. Palma Inc. PaliKrete Pigment Epoxy Flooring System

5. Formulation Description: 100 percent solids

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrates in accordance with resinous flooring manufacturer's written instructions for substrate indicated to ensure adhesion.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:
   a. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete in accordance with resinous flooring manufacturer's written instructions.

3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Perform tests recommended in writing by resinous flooring manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with manufacturer's written instructions.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring in accordance with manufacturer's written instructions.

D. Resinous Materials: Mix components and prepare materials in accordance with resinous flooring manufacturer's written instructions.

3.2 INSTALLATION

A. Apply components of resinous flooring system in accordance with manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.

B. Field-Formed Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring coats. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

1. Integral Cove Base: 4 inches high.

END OF SECTION 09 6723

SECTION 09 6813 – CARPET TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular carpet tile.

B. Related Sections include:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   2. Division 9 Section "Resilient Wall Base and Accessories" for materials and installation.
   3. Division 3 “Cast in Place Concrete”

1.2 SUBMITTALS

A. Product Data: For each type of product indicated in this section and/or on the architect’s drawings.
   1. Material list of items proposed to be provided under this section.
   2. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer’s recommended preparation and installation procedures used on this work.

B. Samples: Samples for verification of the following products, in manufacturer’s standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Label each sample with manufacturers name, material type, color, pattern, and designation indicated on Drawings and carpet schedule. Submit the following:
   1. Full size samples of each type of carpet material required.
   2. 12 inch Samples of each type of exposed edge stripping and accessory item

C. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 01. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floor covering Installers Association at the Commercial II certification level.

B. Single-Source Responsibility: Obtain each type of carpet from one source and by a single manufacturer.

C. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, section 5 “Storage and Handling”
   1. Deliver materials to Work site in original factory wrappings and containers, labeled with identification of manufacturer, brand name and lot number.
   2. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures and humidity. Lay flat, with continuous blocking off ground.

1.5 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Space Enclosure and Environmental Limitations: Do not install carpet until pace is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Special Carpet Warranty: Submit a written warranty executed by carpet manufacturer and Installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, loss of face fiber, edge raveling, snags, runs, and delamination.

1.6 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
   3. Warranty Period: Commercial Lifetime.

1.7 EXTRA MATERIALS

1. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

2. Carpet: Before installation begins, furnish quantity of full-width units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT or WOM as designated on the architect's drawings)

A. Subject to compliance with requirements, provide products as designated on the architect's drawings, or equal upon written approval from architect:

CPT-01
Manufacturer: J&J Flooring
Product: Carpet Tile
Style: Technique 7804
Color: Night Sky 3683
Size: 18"x36"
Installation: Ashlar

CPT-02
Manufacturer: Patcraft
Product: Carpet Tile
Style: Unhemmed 10637
Color: Loom 00550
Size: 18"x36"
Installation: Ashlar

CPT-03
Manufacturer: Patcraft
Product: Carpet Tile
Style: Unhemmed 10637
Color: Blend 00510
Size: 18"x36"
Installation: Ashlar

WOM-01
Manufacturer: Shaw Contract
Product: Walk Off Mat Carpet Tile
Style: All Access – Portal 5T035
Color: Sterling 34557
Size: 24"x24"
Installation: Monolithic

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the carpet manufacturer

3.2 PREPARATION

A. Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation
1. Level subfloor within 1/4 inch in 10 feet, noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.
2. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the carpet manufacturer.
3. Remove subfloor coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil or silicone.
4. Broom or vacuum clean subfloors to be covered with carpet. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust
5. Concrete-Subfloor Preparation; Apply concrete slab primer, according to manufacturer’s directions where recommended by the carpet manufacturer. Verify that concrete slabs comply with ASTM F 710.

3.3 INSTALLATION

A. Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer. Confirm pattern installation method with architect.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non staining marking device.

G. Install pattern parallel to walls and borders.

H. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

I. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

3.4 CLEANING

A. Perform the following operations immediately after completing installation.
1. Remove visible adhesive, seam sealer, and other surfaced blemishes using cleaner recommended by carpet manufacturer.
2. Remove protruding yarns from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element,

3.5 PROTECTION

A. Comply with CRI 104, Section 15: "Protection of Indoor Installation."

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure carpet is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09 6813

SECTION 09 9100 – PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems.

B. Paint and finish all new and existing, exterior and interior exposed surfaces throughout the building as indicated on the Drawings, as listed on the Painting Schedule in Part 3 of this Section, as specified herein, and as needed for a complete and proper installation.

C. Work not included:
   1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces and the area above suspended ceilings;
   2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section unless otherwise indicated;
   3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators, linkages, sensing devices, and motor shafts, unless otherwise indicated;
   4. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates;
   5. Metal surfaces of pre-finished galvalume and galvanized steel, metal roofing, metal fascia and trims, metal siding, metal ceiling, all galvanized bollards, all exposed zinc coated steel plates, anchors, and fasteners, etc. that have galvalume or galvanizing will not require painting under this Section unless otherwise indicated.

D. Definitions: "Paint" or “Epoxy” as used herein, means coating systems materials including primers, emulsions, epoxy enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

E. Related work: Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer-performed under pertinent other Sections.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

E. Color selection and samples:
1. Colors will be selected by the Architect from one or more of the specified manufacturers paint lines. Submit samples on rigid cardboard 8-1/2 inches by 11 inches in size with the Architects scheduled colors and glosses applied, for approval before starting work. Sample panels shall be resubmitted to the Architect until final approval is granted. Finished work shall match approved samples;
2. The Architect may select, allocate, and vary colors on different surfaces throughout the Work, subject to the following:
   a. Exterior work: A maximum of four different colors will be used, with variations for trim, doors, miscellaneous work, and metal work;
   b. Interior work: A maximum of eight different pigmented colors will be used, with variations for trim, wall surfaces and wainscots;
   c. Dark tones: A maximum of four dark tones will be used as accent colors for the interior;

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Protection:
   1. Remove or protect during painting, all finish hardware, accessories, fixtures, plates, lighting fixtures, and similar items installed prior to painting and not required to be painted. If removed, carefully replace and adjust on completion of painting;
   2. Furnish and lay drop cloths in all areas where painter's finish work is being done, to protect floors and all other adjacent work and materials from defacement. Remove all temporary protections and coverings from the work and repair or replace finishes;
   3. Any damage resulting from neglect of the above requirements shall be repaired at the Contractor's expense to the complete satisfaction of the Architect.

D. Environmental Conditions:
   1. No exterior painting shall be done in rainy, damp or frosty weather, or until surface is thoroughly dry. No interior painting or finishing shall be permitted until the building has reached a temperature and humidity level recommended by the manufacturer of the paint products being applied;
   2. Maintain temperature of rooms at 70 degrees F or higher where varnish, lacquer or enamel is being applied and at 50 degrees F or higher during other painting and finishing. Exterior painting shall be done only when air temperature is 40 degrees F or higher and only in dry weather;
   3. Apply material under adequate illumination and ventilation;
   4. In the event excessive moisture is present, the General Contractor shall provide the necessary ventilation to establish appropriate conditions. Should the surface be too dry for the product application, the Painting Contractor shall provide the necessary methods to establish the appropriate conditions.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

   1. Quantity: Furnish an additional 10 percent, but not less than 1 gallon of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: All paint materials and their related products specified herein are based on products of first grade and top line manufactured products, of Sherwin-Williams Company. Subject to compliance with requirements, other manufacturers may be submitted for approval.

B. Semi-transparent colored stain for architectural millwork items shall be by Minwax, or alternatives of the quality necessary to meet the specifications, offering a range of colored semi-transparent colored stain selections, and as approved by the Architect.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work. Correct conditions detrimental to timely and proper completion of the Work prior to proceeding.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Spackle all wall cracks, voids and similar imperfections, in drywall and plaster.

E. Clean all metal free from dust and grease and carefully wire brush to remove all rust or scale. Sand badly rusted spots until metal is clean. Sheet metal, steel and cast wrought iron with priming coat applied, shall be cleaned of debris, and if necessary, the marred surfaces shall be primed before applying the first coat. Clean and lightly sand prefinished metals, such as rooftop mechanical equipment thoroughly before applying the first coat.

F. Galvanized materials shall receive a prime coating of an approved galvanized primer, such as zinc dust. Apply zinc chromate or an equivalent primer as recommended by the paint and aluminum alloy manufacturer to aluminum work, which is specified or noted as being painted.

G. Thoroughly clean, sand, and wipe woodwork to remove all surface dirt.

1. Fill nail holes or similar imperfections smooth with putty after prime coat has become dry and hard. On natural finish wood, the nail hole compound shall be pigmented to match the face veneer.

H. Prepare surfaces of masonry to be painted in strict conformance with the recommendations of the paint manufacturer. Insure that all loose material and material that will dust or dislodge when lightly abraded has been completely removed from masonry surfaces before the application of paint materials.

I. Prepare previously painted and prime coated product surfaces in strict conformance with the recommendations of the Paint Manufacturer. All previously painted surfaces shall be thoroughly cleaned before applying the first coat.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Apply materials with roller or brush, except that spraying will be permitted for items such as mechanical equipment, grilles, or similar items. Mask off adjoining areas not receiving a spray finish against overspray.
2. Paint surfaces behind movable equipment and furniture items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture items with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Allow exterior paints and finishes to dry at least 48 hours between coats. Allow interior paints to dry at least 24 hours between coats. Allow enamels, lacquers and varnishes to dry at least forty-eight hours between coats. Sand lightly between coats with No. 00 sandpaper and dust well before succeeding coat is applied. Allow additional drying time if conditions warrant, to assure that all coats are perfectly dry before applying succeeding coats.

F. Review with the Architect prior to application the surface texture of all painting and finishing. Submit samples, if requested, for approval.

G. All materials throughout shall receive the manufacturer's recommended primer before the finish coats are applied. Touch-up shop applied prime coats, which have been damaged, and touch-up bare areas prior to start of finish coats application.

H. Miscellaneous surfaces and procedures:

1. Exposed mechanical items:
   a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, hangers, and items of similar nature to match adjacent wall and ceiling surfaces, or as directed;
   b. Paint visible duct surfaces behind vents, registers, and grilles flat black;

c. The painting of mechanical piping and equipment shall include the painting of non-ferrous piping and valve and trap bodies in finished spaces;
d. Paint exterior louvers, dampers, and grilles in colors as selected by the Architect;

2. Exposed electrical items: Paint all exterior electrical items in colors as selected by the Architect;
3. Paint hollow metal and miscellaneous metal installations in unfinished spaces;
4. Paint metal doors in unfinished spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 FINISH

A. Finished surfaces shall be uniform in finish and color and free of brush marks, sagging, corduroy and other imperfections. Should any coat be judged unsatisfactory, sandpaper or otherwise clean off this coat and apply another. If the undercoating is disturbed, complete refinishing will be required. Where necessary for proper coverage, one additional coat shall be applied by the painter without any additional cost to the Owner.

B. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

C. Should workmanship be found defective, proper preparatory work shall be done and additional coats applied as necessary to give finish in accordance with specified requirements.

3.6 PAINTING SCHEDULE

A. The following paint schedule shall generally cover the type of paint required for the project based on Sherwin Williams Company. Verify finishes with finish schedule and Architect prior to application. Verify first coat in accordance with manufacturer's recommendation for previously painted surfaces.

INTERIOR PAINT SCHEDULE

CMU – Pre-Catalyzed EPOXY -eggshell finish, including existing masonry walls
- Filler: PrepRite Block Filler
- 2 finish coats: ProIndustrial Pre-Catalyzed Water-Based Epoxy, eggshell

CMU – Pre-Catalyzed EPOXY semi-gloss finish, including holding cells, janitor closets, gym
- Filler: PrepRite Block Filler
- 2 finish coats: ProIndustrial Pre-Catalyzed Water-Based Epoxy, semi-gloss

Gypsum – eggshell finish
- Primer: ProMar 200 Zero Primer
- 2 finish coats: ProMar 200 Zero VOC eggshell

Gypsum – ceilings and soffits- flat finish
- Primer: ProMar Ceiling Paint flat
- Finish coat: ProMar Ceiling Paint flat

Gypsum – Pre-Catalyzed EPOXY – eggshell
- Primer: ProMar 200 Zero VOC Primer
- 2 finish coats: ProIndustrial Pre-Catalyzed Water-Based Epoxy, eggshell

Wood – stained finish
- Stain: Minwax 250
- 2 finish coats: Wood Classics WB Polyurethane A68

Ferrous Metal and Non-Ferrous Metal – Doors, Frames, Stair components and miscellaneous metals
- Primer: ProIndustrial Pro-Cryl Universal Primer
- 2 finish coats: ProIndustrial WB Alkyd Urethane Enamel, B53 series, semi-gloss

Exposed Ceilings:
- Primer (Ferrous and Non-Ferrous Metal): ProIndustrial Pro-cryl Universal Primer
- 2 coats: Low VOC Waterborne Acrylic Dryfall, Eggshell B42-W00082

EXTERIOR SCHEDULE

Exterior AES
- Primer: MacroPoxy 646 Epoxy
- 2 finish coats: Hi Solids Polyurethane, semi-gloss

Ferrous Metal and Non-Ferrous Metal – Doors, Frames, Stair components and miscellaneous metals
- Primer: ProIndustrial Pro-Cryl Universal Primer
- 2 finish coats: ProIndustrial WB Alkyd Urethane Enamel, B53 series, semi-gloss

END OF SECTION 09 9100

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of signs:

1. Cast letters and numbers.

1.2 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for selection of color, pattern, and texture selected and compliance with requirements indicated:

a. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
b. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.

1.3 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Manufactures specified date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Manufacturers of Dimensional Letters and Graphics:

a. ASI Sign Systems, Inc.
b. Gemini Incorporated.
c. Metallic Arts, Inc.
d. The Southwell Company.
e. Vomar Products, Inc.

2.2 DIMENSIONAL LETTERS AND NUMBERS

A. Cast Letters and Numbers: Form individual letters and numbers by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.

1. Metal: Aluminum.
2. Letter Height: As indicated.
3. Letter Style: As indicated.

2.3 FABRICATION

A. General: Provide manufacturer's standard sign assemblies in accordance with requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

2.4 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Baked-Enamel Finish: AA-M4xC12C42R1x (Mechanical Finish: Manufacturer's standard, other nondirectional textured; Chemical Finish: Chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

a. Organic Coating: Thermosetting-modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils, medium gloss.

1) 1) Color: As selected by the Architect from the manufacturer's standard colors

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
C. Verify that electrical service is correctly sized and located to accommodate signs.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

A. General: Install signs using mounting methods indicated and in accordance with manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

3.4 CLEANING

A. Remove temporary protective coverings and strippable films as signs are installed.
B. On completion of installation, clean exposed surfaces of signs in accordance with manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 101423 – PANEL SIGNAGE

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following types of signs:
   1. Panel signage.

1.2 SUBMITTALS

A. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

   1. Provide message list, typestyles, and graphic elements (including tactile characters and Braille for each sign required, including large-scale details of wording and lettering layout.
   2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
   3. Show sign mounting heights.

C. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

   1. Samples for initial selection of color, pattern, and texture:

      a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provision in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1

B. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

C. UL and NEMA Compliance: Provide lighting fixtures and electrical components for illuminated signs that are labeled and listed by UL and comply with applicable NEMA standards.

D. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

E. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in

dimensions and profiles do not change the design concept as judged by the Professional. The burden of proof of equality is on the proposer.

1.4 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Manufacturers of Dimensional Letters:
      a. ASI Sign Systems, Inc.
      b. I-Signs
      c. Matthews International Corp.

2.2 MATERIALS

A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790, with a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
   1. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

C. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.3 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
   1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Framed Panel Signs: Fabricate frames to profile indicated; comply with the following requirements for materials and corner conditions:
   1. Material: Acrylic plastic.
   2. Corner Condition: Square corners.

C. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.

D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.

E. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.

1. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.

F. Panel Sign Types: All signs shall comply with Americans with Disabilities Act. Provide the following panel signs.

1. Restroom signs shall have engraved pico-graphic and room name. Provide one (1) sign for every restroom/latrine shown on the Drawings.
2. Tactile Exit signs stating EXIT and complying with ICC A117.1 shall be provided adjacent to each door to an egress stairway, adjacent to each door to an exit passageway, and adjacent to each door at the exit discharge to the building exterior.

2.4 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Professional from the manufacturer's standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces that do not permit installation of concealed fasteners. Do not use this method for vinyl-covered or rough surfaces. Provide blank, matching opaque back plate for signs located on glass sidelights, install on opposite side of glazing to conceal rear of sign panel.

C. Install signs and lettering level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance. Install backlit lettering with all accessories for proper function.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 101423

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Abuse-Resistant Wall Coverings. (WC)

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
2. Include fire ratings of units recessed in fire-rated walls.

B. Shop Drawings: For each type of wall showing locations, extent and methods of attachments to substrate. Include seam locations.

C. Samples for Verification: For each type of wall protection and for each color, pattern, texture and finish specified.

1. Abuse-Resistant Wall Covering: Full width by a length of 36”

1.3 QUALITY ASSURANCE

A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index:5 or less.
2. Smoke-Developed Index:40 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1

C. Obtain wall protection products single source from single manufacturer.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type of exposed plastic material.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store wall protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area between 60 deg F and 80 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature between 65 deg F and 75 deg F.

PART 2 - PRODUCTS

2.1 ABUSE-RESISTANT WALL COVERINGS

A. Abuse-Resistant Wall Covering: Vinyl wall covering.

1. Basis-of-Design Product: As indicated on the drawings. (VWC-01)
2. Size: Custom- Verify in Field
3. Weight: 9.3 oz per square foot
4. Repeat: Custom
5. Color and Texture: As indicated on the drawings.
6. Height: Custom- Verify in Field
7. Mounting: Adhesive.

2.2 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

B. Adhesive: As recommended by protection product manufacturer.

2.3 FABRICATION

A. Fabricate wall protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.

B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Examine wall protection to ensure that the material, color, and quality are satisfactory and as ordered. Check that the quantity and dimensions match the required specifications, prior to cutting.

D. Complete finishing operations, including painting, before beginning installation of wall surface protection system materials.

E. Wall surfaces to receive impact-resistant wall covering materials shall be dry and free from dirt, grease, loose paint, and scale.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer’s written instructions for surface preparation.

B. Complete finishing operations, including painting, before installing wall protection.

C. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION OF WALL COVERING

A. Installation Quality: Install wall protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work. Verify in field heights and widths of the space prior to installation.

B. Adhesive: As recommended by protection product manufacturer.

C. Mounting Heights: Install wall protection in locations and at mounting heights indicated on Drawings.

D. Do not install wall protection systems until temperature is stable and permanent lighting is in place.

E. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

F. Cut wall protection material into full width strips in roll number sequence. Change the roll numbers at partition breaks and corners. Install strips in same order as cut from roll.

G. For even-texture, or random-match patterns, reverse every other strip.

H. Install wall protection without lifted or curling edges and without visible shrinkage.

I. Match pattern per manufacturers direction above the finish floor.

J. If railroading is required (horizontal application) install seams vertical and plumb at least 8 inches from outside corners and 8 inches from inside corners, unless a change of pattern or color exists at corner. Horizontal seams are not recommended.

K. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

L. Fully bond wall protection to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

A. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

B. Replace strips that cannot be cleaned.

C. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 102600

SECTION 10 2800 – TOILET AND SHOWER ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Toilet accessories.
2. Shower accessories.
3. Childcare accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

C. Warranty: Sample of special warranty.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 TOILET AND SHOWER ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bobrick Washroom Equipment, Inc.
2. American Specialties, Inc.

3. Bradley Corporation.

B. Grab Bar [indicated on Drawings as #1, #2, #3, and #16- on 2-A713.]
   1. Quantity: As indicated on Drawings.
   2. Basis of Design: ASI 3000
   3. Quantity: As indicated on Drawings.
   4. Mounting: Flanges with concealed fasteners.
   5. Material: Stainless steel type 304, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
   6. Outside Diameter: 1-1/2 inches.
   7. Configuration and Length: As indicated on Drawings; comply with applicable codes.

C. Toilet Tissue (Roll) Dispenser [indicated on Drawings as #4]:
   1. Basis of Design: Bobrick B-2840
   2. Quantity: As indicated on Drawings.
   3. Mounting: Concealed backing with sheet metal screws.
   4. Material: Stainless steel type 304, 1.0mm thick and 1.2 mm thick.
      a. Finish: Satin

D. Sanitary Napkin Disposal [indicated on Drawings as #5]:
   1. Basis of Design: Bobrick B-270
   2. Quantity: As indicated on Drawings.
   3. Mounting: Concealed backing with sheet metal screws.
   4. Material: Stainless steel type 304, 0.8mm thick
      a. Finish: Satin

E. Mirror Unit [indicated on Drawings as #6]:
   1. Basis of Design: ASI 0620
   2. Frame: Stainless-steel channel.
      a. Corners: Manufacturer's standard.
   3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
      a. Top and bottom brackets, 20 gauge corrosion protected steel and shall be spot welded into “H” hanger. Mirror shall be secured to lower bracket with locking screw.
   4. Size: 24-inches wide by 36-inches high.
   5. Glass: ¼-inch thick plate glass, silver coated and hermetically sealed.

F. Mirror Unit [indicated on Drawings as #11 on sheet 2-A713]:
   1. Basis of Design: ASI 0620
   2. Frame: Stainless-steel channel.
      a. Corners: Manufacturer's standard.
   3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
      a. Top and bottom brackets, 20 gauge corrosion protected steel and shall be spot welded into “H” hanger. Mirror shall be secured to lower bracket with locking screw.
   4. Size: 24-inches wide by 60-inches high.
   5. Glass: ¼-inch thick plate glass, silver coated and hermetically sealed.

G. Recessed Paper Towel Dispenser [indicated on Drawings as #7]:
   1. Basis of Design: Bobrick B-36903
   2. Quantity: As indicated on Drawings.
   3. Mounting: Recessed between wall framing per manufacturer's instructions.
   4. Material: Stainless steel type 304, 1.2mm thick
      a. Finish: Satin

H. Liquid-Soap Dispenser [indicated on Drawings as #8]:
   1. Basis of Design: ASI 20364
   2. Quantity: As indicated on Drawings.
   3. Mounting: Wall plugs with screws
   4. Material: Stainless steel type 304
      a. Finish: Satin

I. Baby Changing Station [indicated on Drawings as #10- Sheets 1-A712 & 2-A712]:
   1. Basis-of-Design Product: Koala Kare
   2. Mounting: Surface.
   3. Material: Type 304 stainless steel, all welded construction, satin finish. Door shall be 16 gauge. Flange and cabinet shall be 18 gauge.

J. Toilet Tactile Sign [indicated on Drawings as #11 on sheets 1-A712 & 2-A712, #10 on 2-A713]:
   1. Refer to 10 1400 Panel Signage.

K. Towel Hook [indicated on Drawings as #9]:
   1. Basis-of-Design Product: Bobrick B-6727
   2. Description: Projecting minimum of 3 inches from wall surface.
   3. Material and Finish: Stainless steel, No. 4 finish (satin).
   4. Quantity: As indicated on Drawings.

L. Recessed Stainless Steel Shelf [indicated on Drawings as #12 on sheet 2-A713]:
   1. Basis-of-Design Product: Bobrick B-760
   2. Material and Finish: Stainless steel, Satin finish
   3. Size: 19- ¼" W x 9- 11/16" H x 4" D
   4. Quantity: As indicated on Drawings.

M. Shower Curtain Rod and Curtain [indicated on Drawings as #15 on sheet 2-A713]:
   1. Description: 1-inch OD; fabricated from nominal 0.0375-inch- thick stainless steel.
   2. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
   3. Finish: No. 4 (satin).
   4. Quantity: One per shower.
   5. Shower Curtain:
      a. Size: Minimum 6 inches wider than opening by 72 inches high.
      b. Material: Vinyl, minimum 10 oz. or 0.008-inch- thick vinyl, with integral antibacterial agent.
      c. Color: White.
      d. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
      e. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

f. Provide one curtain per shower.

N. Folding Shower Seat [indicated on Drawings as #14 on sheet 2-A713]:
1. Configuration: rectangular-shaped seat, designed for wheelchair access.
2. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
3. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
4. Quantity: As indicated on Drawings.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 2800

SECTION 10 4400 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Portable fire extinguishers
   2. Cabinets
   3. Mounting brackets

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher, cabinets, and mounting brackets.

B. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.

C. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS

A. Multi–purpose dry chemical fire extinguishers, 4A:60B:C UL rating:
   1. Larsen's Manufacturing Company, Model "MP10".
   2. Potter Roemer, Model Number 3010.
   3. Or alternative of the quality necessary to meet the specifications.

B. Service, charge, and tag each fire extinguisher not more than five calendar days prior to the Date of Substantial Completion of the Work as that Date is established by the Architect.

2.2 FIRE EXTINGUISHER CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Larsen's Manufacturing Company
   2. Potter Roemer
   3. Or alternatives of the quality necessary to meet the specifications.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

C. Cabinet Construction: Manufacturer's standard box (tub), with trim, frame, door and hardware to suit cabinet type, trim style, and door indicated. Weld joints and grind smooth. Provide additional perimeter reinforcing all sides to not permit bowing, flexing, and to maintain straight true to line form of perimeter. Ease and grind all corners to eliminate any sharp edges.

D. Non-rated cabinet: Larsen's Architectural Series AL-2409-6R with 2-1/2 inches projection trim style, semi-recessed, Vertical Duo Glass door, 1/4 inch clear tempered glass, aluminum mill finish, recessed handle.

E. Fire-rated cabinet: Larsen's Architectural Series FS-AL-2409-R4, "Flame-Shield", with 3-1/2 inches projection trim style, semi-recessed, Vertical Duo Glass door, 1/4 inch clear tempered glass, aluminum mill finish, recessed handle.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Larsen's Manufacturing Company.
   b. Ansul Incorporated; Tyco International Ltd.
   c. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   d. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
   a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers, cabinets and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Fire Extinguisher Cabinets: 48 inches above finished floor to top of cabinet.
   2. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.

C. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

END OF SECTION 10 4400

SECTION 10 5113 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Knocked-down heavy duty lockers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachment details.
2. Include locker identification system and numbering sequence.

C. Samples: For each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in ICC A117.1.

2.2 KNOCKED-DOWN LOCKERS (#13 on Drawings)

A. Manufacturers:

1. Spacesaver Corporation (Basis of Design)
2. Penco Products, Inc.
3. Salsbury Industries

B. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than six louver openings at top and bottom for single-tier lockers.

C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
2. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.
3. Shelves: 0.024-inch nominal thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

E. Hinges:

1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.

F. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.

1. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch

nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.

2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

G. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.

a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism.

H. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.

I. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

J. Hooks: Manufacturer's standard ball-pointed hooks, aluminum or steel; zinc plated.

K. Drawer Base with Integral Seat:

1. Provide a 72- or 78-inches high locker with a 9-inch front extension to create the drawer base.

2. 16-gauge drawer body, rated at 250 pounds per pair.
a. Drawer face with integral finger grab and punched to accept built-in spring bolt locker lock, key lock.
b. Hardwood seat: Laminated selected hardwood, 1-1/4 inch (31.75 mm) full finished thickness, corners rounded and sanded, surfaces finished with two coats of clear lacquer.

3. Depth: 9-1/2 inches.

L. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

M. Finish: Baked enamel or powder coat.

1. Color: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

D. Knocked-Down Construction: Fabricate metal lockers by preassembling at plant prior to shipping, using manufacturer's nuts, bolts, screws, or rivets.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

G. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
3. Anchor back-to-back metal lockers to floor.

B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces or face frames.

C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

END OF SECTION 105113

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops.
2. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plastic-laminate-clad countertops. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples: Plastic laminates in each type, color, pattern, and surface finish required.

1.3 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install wood countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Stofanak Custom Cabinetry

2. American Millwork & Cabinetry

3. Yeager Custom Cabinetry

2.2 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

B. Grade: Custom

C. High-Pressure Decorative Laminate: ISO 4586-3, Grade HGS and HGP.

1. Wilsonart

2. Formica

3. Nevamar

D. Products: Subject to compliance with requirements, provide products as designated on the architect's drawings, or equal upon written approval from architect:

PL-02
Manufacturer: Formica, or pre-approved equals
Color: Refer to the architectural drawings for basis of design
Location: Countertops.

PL-03
Manufacturer: Wilsonart, or pre-approved equals
Color: Refer to the architectural drawings for basis of design
Location: Countertops.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces

F. Core Material: MDF

G. Core Thickness: 3/4 inch

H. Backer Sheet: Provide plastic-laminate backer sheet, ISO 4586-3, grade to match exposed surface, on underside of countertop substrate.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130
2. Particleboard: ANSI A208.1, Grade M-2

3. Softwood Plywood: DOC PS 1.

2.4 ACCESSORIES

A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Outside Diameter: 2 inches (51 mm)
   2. Color: Coordinate color with Architect.

2.5 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Type II water-resistant type as selected by fabricator to comply with requirements.

   1. Adhesive for Bonding Edges: Hot-melt adhesive

2.6 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

   2. Coordinate grommet hole locations with the owner. Architect to select grommet hole accessory color from manufacturers full range.
   3. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare

edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
2. Secure backsplashes to walls with adhesive.
3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

SECTION 12 3661 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge profiles, and methods of joining.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Corian Quartz or a comparable product by one of the following:

a. Wilsonart Quartz
b. Cambria

2. Colors and Patterns: As indicated on Drawings.

B. Particleboard: ANSI A208.1, Grade M-2.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Configuration:

C. Countertops: 3cm thick, quartz agglomerate, unless noted otherwise- refer to drawings for basis of design.

D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

E. Joints: Fabricate countertops in sections for joining in field. Joint locations shall be submitted with shop drawings for Architect approval.
   1. Joint Type: Sealant filled, 1/16 inch in width.

2.3 INSTALLATION MATERIALS

A. Adhesive and sealant: Product recommended by quartz agglomerate manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
   1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed,

and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

G. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 12 3661.19

SECTION 13 4813 - MANUFACTURED SOUND AND VIBRATION CONTROL COMPONENTS

PART 1 - GENERAL

1.1 -SUMMARY

A. Section Includes: vibration absorption material.

1.2 - REFERENCES

A. American Society for Testing and Materials (ASTM):
    1. ASTM E84 Standard Test Method for Surface Burning Characteristics ofBuilding Materials.

    2. ASTM E90-02 Standard Test Method for Laboratory Measurement ofAirborne Sound Transmission Loss of Building Partitions.

1.3 - SYSTEM DESCRIPTION

A. Design Requirements: Provide products and systems that have been manufactured, fabricated and installed to meet the following criteria:
    1. See Partition types 10 & 11 on G004

1.4 -SUBMITTALS

A. Product Data: Submit manufacturer's product data and installationinstructions.

1.5 - QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer with experience with similar projects.

B. Materials Qualifications: Provide ASTM test reports from independent laboratories with NVLAP certification of standards compliance, documentingproduct performance specified for:

1. Acoustical properties
2. Physical properties
3. Fire-related properties

C. Receiving, Storage and Handling

1. Verify the quantity and condition of materials received.
2. Provide secure area for storage.
3. Keep material from freezing, keep above 40 degrees F.

D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 - MANUFACTURERS

A. Basis of Design Manufacturer: The Green Glue Company

2.2 - MATERIALS

A. Provide Green Glue Viscoelastic damping compound (Basis of design). Any substitutions shall match performance specs of this product.

1. Physical Properties:

- Active Content: 68% +/-5%
- Working Time: 30 minutes at room temperature
- Viscosity: Light Paste 65,000 cpd
- Color: Green5.
- voe: >2 g/1
- Flash Point: >200 degrees F
- Application Temperature: 40 to 90 degrees F

B. Provide Green Glue two-piece Noiseproofing Clips (Basis of Design):

1. See notes on Partition Types on Drawing sheet G004.
2. Installation layout and method to be per manufacturer’s specifications

PART 3 - EXECUTION

3.1 - EXAMINATION

A. Verification of Site Conditions

1. Do not begin installation until substrates have been properly prepared.
2. Do not begin if room temperature is below freezing.

3.2 - PREPARATION

A. Clean surfaces thoroughly before installation.

B. Follow the manufacturer's guidelines for preparation and installation.

3.3 - INSTRUCTIONS FOR USING COMPOUND WITH DRYWALL

A. Construct standard wall framing.

B. Install the first standard layer of drywall as normal.

C. Remove any dust or debris from drywall surfaces to be glued.

D. Apply prescribed quantity of compound in a random pattern to the back of thesecond layer of drywall. (Use 2 tubes of compound per 4’x8’ sheet)

E. Assemble the coated drywall layer to the first layer and screw into place asnormal.

1. Use standard drywall screws.
2. Screw the second layer into the wall studs.
3. Screw spacing according to local building code.

F. Seal the assembly with caulk or sealant.

1. Seal the intersection of the wall and floor.
2. Seal any gaps between walls and ceiling.
3. Seal the electrical boxes.

G. Drywall can be finished immediately after wall assembly

3.4 - PROTECTION

A. Protect installed products until completion of project.

B. Repair or replace any mechanical damage or deficiencies before SubstantialCompletion.

END OF SECTION 13 4813

SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining CPVC Plastic Piping: ASTM F 493.

2.3 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.4 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated and rough brass.

2.5 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and

calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

O. Verify final equipment locations for roughing-in.

P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.4 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.5 GROUTING

A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 210500

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Sprinklers.

B. Related Sections:

1. Division 21 Section "Fire-Suppression Standpipes" for standpipe piping.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Available fire-hydrant flow test records indicate the following conditions:

a. Date: 08-17-2022.
b. Time: 07:30 AM
c. Performed by: Broadhead Creek Regional Authority.
d. Location of Flow Fire Hydrant F: 3361 PA-611.
e. Static Pressure at Residual Fire Hydrant R: 150 psig.
f. Measured Flow at Flow Fire Hydrant F: 1590 gpm.
g. Residual Pressure at Residual Fire Hydrant R: 90 psig.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent or 10 psi, whichever is more stringent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:

a. Building Service Areas: Ordinary Hazard, Group 1.
b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
c. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
d. Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:

a. Office Spaces: 225 sq. ft..
b. Storage Areas: 130 sq. ft..
c. Mechanical Equipment Rooms: 130 sq. ft..
d. Electrical Equipment Rooms: 130 sq. ft..
e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified Installer and professional engineer.

E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

F. Welding certificates.

G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

H. Field quality-control reports.

I. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Uncoated, Steel Couplings: ASTM A 865, threaded.

D. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Cast-Iron Flanges: ASME 16.1, Class 125.

G. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

H. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

I. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International, Inc.
    b. Tyco Fire & Building Products LP.
    c. Victaulic Company.

2. Pressure Rating: 175 psig inimum.
3. Painted, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: [AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick] [or] [ASME B16.21, nonmetallic and asbestos free].

1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International, Inc.
    b. National Fittings, Inc.
    c. Shurjoint Piping Products.
    d. Tyco Fire & Building Products LP.
    e. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175 psig.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. FlexHead Industries, Inc.
    b. SprinkFlex.
    c. Tyco.
    d. Victaulic Company.
    e. Viking.

2. Standard: UL 2443.and FM 1637.
3. Type: Fully stainless-steel flexible hose for connection to sprinkler, and with mounting bracket listed and approved for connection to ceiling grid or gypsum wall board ceiling assembly as appropriate.
4. Bend radius to 2 inch for proper installation in confined spaces.
5. Pressure Rating: 175 psig minimum.
6. Size: Same as connected piping, for sprinkler.

2.5 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. AFAC Inc.
2. Globe Fire Sprinkler Corporation.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.
6. Victaulic Company.
7. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

2.6 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated or rough-brass finish with set-screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with set-screw or spring clips.

E. Split-Casting, Cast-Brass Escutcheons: Polished chrome-plated or rough-brass finish with concealed hinge and set-screw.

F. Split-Plate, Stamped-Steel Escutcheons: Chrome-plated finish with concealed hinge, set-screw or spring clips.

2.7 SLEEVES

A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set-screws.

2.8 GROUT

A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Division 21 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Division 21 Section "Fire-Suppression Systems Insulation."

3.2 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.4 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.5 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.6 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.

3.7 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.

2. Sleeves for Piping Passing through Gypsum-Board Partitions:

a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
b. Exception: Sleeves are not required for water-supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

3. Sleeves for Piping Passing through Interior Concrete Walls:

a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run excess-pressure pumps.
6. Coordinate with fire-alarm tests. Operate as required.

7. Coordinate with fire-pump tests. Operate as required.
8. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.11 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with [threaded ends; cast-iron threaded fittings; and threaded] [grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved] joints.

B. Sprinkler specialty fittings may be used, downstream of control vales, instead of specified fittings.

C. Wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Equipment installation requirements common to equipment sections.
8. Concrete bases.
9. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe.

C. Pressure Plates: Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated and rough brass.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Non-pressure Piping: Join according to ASTM D 2855.
5. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 220500

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in plumbing equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with

indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 22 0513

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

6. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
7. Pressure Plates: Stainless steel.
8. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."

3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

    a. Piping Smaller Than NPS 6: Cast-iron wall sleeves or Galvanized-steel wall sleeves.
    b. Piping NPS 6 and Larger: Cast-iron wall sleeves or Galvanized-steel wall sleeves.

2. Exterior Concrete Walls below Grade:

    a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.

    c. Retain first subparagraph below if using sleeve-seal systems; delete if using sleeve-seal fittings.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves, Stack-sleeve fittings, Molded-PE or -PP sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 22 0517

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gages.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Palmer - Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Die-cast aluminum or brass, 7 inches long.

C. Tube: Red or blue reading, mercury or organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass or plastic.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 BIMETALLIC-ACTUATED DIAL THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Palmer - Wahl Instruments Inc.
   2. Trerice, H. O. Co.
   3. Weiss Instruments, Inc.
   4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.

C. Case: Dry type, stainless steel with 3-inch diameter.

D. Element: Bimetal coil.

E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

F. Pointer: Red or other dark-color metal.

G. Window: Glass or plastic.

H. Ring: Stainless steel.

I. Connector: Adjustable angle.

J. Stem: Metal, for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

   1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

      a. Palmer Wahl Instrumentation Group.
      b. Trerice, H. O. Co.
      c. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
      d. Weiss Instruments, Inc.
      e. WIKA Instrument Corporation - USA.

2. Standard: ASME B40.100.
3. Case: **Sealed**; **cast aluminum or drawn steel**; **4-1/2-inch** nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with **NPS 1/4 or NPS 1/2**, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in **psi**.
8. Pointer: Dark-colored metal.
9. Window: **Glass**.
10. Ring: **Metal**.
11. Accuracy: **Grade B, plus or minus 2 percent of middle half of** scale range.

B. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

    a. Palmer Wahl Instrumentation Group.
    b. Trerice, H. O. Co.
    c. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
    d. Weiss Instruments, Inc.
    e. WIKA Instrument Corporation - USA.

2. Standard: ASME B40.100.
3. Case: **Liquid-filled** type(s); **cast aluminum or drawn steel**; **4-1/2-inch** nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with **NPS 1/4 or NPS 1/2**, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in **psi**.
8. Pointer: Dark-colored metal.
9. Window: **Glass**.
10. Ring: **Metal**.
11. Accuracy: **Grade B, plus or minus 2 percent of middle half of** scale range.

C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Palmer - Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

D. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry type, drawn steel or cast aluminum, plastic 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.

4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass or plastic.
8. Ring: Metal.
9. Accuracy: Grade B, plus or minus 2 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

E. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install thermometers at cold water and hot water inlet, and hot water outlet of water tempering valve for water heater.

B. Install liquid-in-glass thermometers in the outlet of each domestic, hot-water heater.

C. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions.
2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install dry-case-type pressure gages at suction and discharge of each pump.

C. Install dry-case-type pressure gage at domestic water service entry into building.

D. Install liquid-filled-type pressure gage at compressed air dryer discharge.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

C. Install needle-valve and snubber fitting in piping for each pressure gage.

D. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.

E. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION 22 0519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Bronze swing check valves.
4. Iron swing check valves.
5. Iron swing check valves with closure control.

B. Related Sections:

1. Division 02 water distribution piping Sections for general-duty and specialty valves for site construction piping.
2. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
3. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psi .
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze.

i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Stockham Division.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

A. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball.
2. Throttling Service: Ball.
3. Pump-Discharge Check Valves:

    a. NPS 3 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two-piece, full port, brass or bronze with brass or bronze trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two-piece, regular port, brass or bronze with brass trim.
4. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
5. Iron Gate Valves: Class 125, OS&Y.
6. Iron Globe Valves: Class 125.

END OF SECTION 22 0523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. See Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

C. See Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.3 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.

14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 0529

SECTION 22 0548 - VIBRATION ISOLATION AND SEISMIC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Restraining braces and cables.

B. The extent of vibration isolation and seismic restraints work is indicated by Drawings and schedules and by requirements of this Section.

C. The Contractor shall employ the services of a licensed Professional Engineer registered in the State of Pennsylvania to design, submit, and supervise the installation of seismic restraining products applicable to all equipment and piping systems installed by the Contractor.

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: 90 mph.
2. Expsosure Category: C
3. Wind Importance Factor: 1.15
4. GCpi: +/-0.18

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co., Inc.

D. Pads : Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

E. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

F. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

G. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch-thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

H. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

I. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel up or down before contacting a resilient collar.

J. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

K. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

L. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

M. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch-thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

N. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch-thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION-CONTROL DEVICE INSTALLATION

A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES oran agency acceptable to authorities having jurisdiction] providing required submittals for component.

C. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

D. Install cables so they do not bend across edges of adjacent equipment or building structure.

E. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES oran agency acceptable to authorities having jurisdiction] providing required submittals for component.

F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 22 0548

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.

1.3 SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Cold Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

2. Domestic Hot Water and Hot Water Recirculating Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

3. Natural Gas Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

4. Propane Gas Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

5. Oxygen Piping:

   a. Background Color: Green.
   b. Letter Color: White.

6. Compressed Air Piping:

   a. Background Color: Blue.
   b. Letter Color: White.

7. Sanitary Vent Piping:

   a. Background Color: Green.
   b. Letter Color: White.

8. Sanitary Waste Piping:

a. Background Color: Green.
b. Letter Color: White.

END OF SECTION 22 0553

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Flexible elastomeric.
   b. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied fabric-reinforcing mesh.
8. Field-applied jackets.
9. Tapes.
10. Securements.
11. Corner angles.

B. Related Sections include the following:
1. Division 22 Section "HVAC Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.

6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.
8. Detail field application for each equipment type.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. High-Temperature, Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type V, without factory-applied jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; HTB 23 Spin-Glas.
b. Owens Corning; High Temperature Flexible Batt Insulations.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-35.
    b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    c. ITW TACC, Division of Illinois Tool Works; CB-50.
    d. Marathon Industries, Inc.; 590.
    e. Mon-Eco Industries, Inc.; 55-40.
    f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-10.
    b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    d. Marathon Industries, Inc.; 550.
    e. Mon-Eco Industries, Inc.; 55-50.
    f. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; CP-76-8.
    b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

5. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

   a. Products: Subject to compliance with requirements, provide one of the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for equipment and pipe.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto PVC Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; Metal Jacketing Systems.
   b. PABCO Metals Corporation; Surefit.
   c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing, or Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Color: Flat black
5. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

   a. Same material, finish, and thickness as jacket.
   b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
   c. Tee covers.
   d. Flange and union covers.
   e. End caps.
   f. Beveled collars.
   g. Valve covers.
   h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
   b. Compac Corp.; 104 and 105.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    b. Compac Corp.; 110 and 111.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    b. Compac Corp.; 130.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    b. Compac Corp.; 120.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209 , Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with seal wing or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the installation of heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 7 Section “Building Insulation for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Building Insulation."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut

sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire

frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

D. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.8 FINISHES

A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Heat-Exchanger (Water-to-Water for Domestic Water Heating Service) Insulation: Mineral-Fiber Pipe and Tank: 2 inches thick.

D. Domestic Hot-Water Storage Tank Insulation: Mineral-Fiber Pipe and Tank: 4 inches thick.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:
   1. NPS 1-1/4 and smaller:
      a. Flexible Elastomeric: 1 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
   2. NPS 1-1/2 and larger:
      a. Flexible Elastomeric: 1-1/2 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

B. Domestic Cold Water (Potable): Insulation shall be one of the following:
   1. NPS 1 and smaller:
      a. Flexible Elastomeric: 1/2 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
   2. NPS 1-1/4 and larger:
      a. Flexible Elastomeric: 1 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping exposed within finished kitchen spaces (to 10 feet above finished floor): Jacket shall be the following:
   1. PVC preformed, 30 mils thick.

D. Piping exposed within public spaces with open-ceiling: Jacket shall be the following:
   1. Aluminum preformed, 30 mils thick. Painted flat black.

END OF SECTION 220700

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Flexible connectors.
4. Escutcheons.
5. Sleeves and sleeve seals.

B. Related Section:

1. Division 2 Section "Water Distribution" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 TRANSITION FITTINGS

A. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

B. Sleeve-Type Transition Coupling: AWWA C219.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description:

a. Pressure Rating: 150 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.

d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

1. Description:

a. Electroplated steel nipple complying with ASTM F 1545.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

2.7 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.8 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew.

E. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.9 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.10 SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.11 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size

pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

N. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

O. Install thermometers and outlet piping from each storage type water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 3 and smaller.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 3 and smaller. Comply with

requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 to NPS: Use dielectric flange kits.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.10 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish stamped steel with set screw.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish

4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass with polished chrome plated finish.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

C. Escutcheons for Existing Piping:

1. Chrome-Plated Piping: Split casting, cast brass with chrome-plated finish.
2. Insulated Piping: Split plate, stamped steel with concealed or exposed-rivet hinge and spring clips.
3. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
4. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
5. Bare Piping in Unfinished Service Spaces: Split casting, cast brass with polished chrome-plated finish.
6. Bare Piping in Equipment Rooms: Split casting, cast brass.
7. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting floor plate.

3.11 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
    c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestop materials and installations.

3.12 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.13 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.14 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.15 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.16 PIPING SCHEDULE

Value Engineering: ProPress copper fittings are permissible for all domestic water piping 1-1/2" and smaller

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard or soft copper tube, ASTM B 88, Type L (ASTM B 88M Type B); wrought-copper solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
   1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B) wrought-copper solder-joint fittings; and brazed soldered joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be the following:

   1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B) wrought-copper solder-joint fittings; and brazed soldered joints.

END OF SECTION 22 1116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Strainers.
6. Drain valves.
7. Water hammer arresters.
8. Trap-seal primer valves.

B. See Division 22 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.

C. See Division 22 Section "Water Filtration Equipment" for water filters in domestic water piping.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCPTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ames Co.
    b. Cash Acme.
    c. Conbraco Industries, Inc.
    d. FEBCO; SPX Valves & Controls.
    e. Rain Bird Corporation.
    f. Toro Company (The); Irrigation Div.
    g. Watts Industries, Inc.; Water Products Div.
    h. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Arrowhead Brass Products, Inc.
    b. Cash Acme.
    c. Conbraco Industries, Inc.
    d. Legend Valve.
    e. MIFAB, Inc.
    f. Prier Products, Inc.
    g. Watts Industries, Inc.; Water Products Div.
    h. Woodford Manufacturing Company.
    i. Zurn Plumbing Products Group; Light Commercial Operation.
    j. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Body: Bronze, nonremovable, with manual drain.

4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Watts Industries, Inc.; Water Products Div.
   b. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
4. Size: NPS 3/4.
5. Body: Bronze.
6. End Connections: Union, solder joint.
7. Finish: Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Watts Industries, Inc.; Water Products Div.
   b. Zurn Plumbing Products Group; Wilkins Div.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved] for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Configuration: Designed for horizontal, straight through] flow.
5. Accessories:

C. Double-Check Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Watts Industries, Inc.; Water Products Div.
   b. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size: See Drawing if applicable.
6. Design Flow Rate: See Drawings if applicable.
7. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.

8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

9. Configuration: Designed for horizontal, straight through flow.
10. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 1/2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 3 and larger.

2.3 BALANCING VALVES

A. Memory-Stop Balancing Valves :
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Conbraco Industries, Inc.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Jenkins Valves.
      d. Crane Co.; Crane Valve Group; Stockham Div.
      e. Hammond Valve.
      f. Milwaukee Valve Company.
      g. NIBCO INC.
      h. Red-White Valve Corp.

   2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
   3. Pressure Rating: 400-psig minimum CWP.
   4. Size: NPS 2 or smaller.
   5. Body: Copper alloy.
   6. Port: Standard or full port.
   7. Ball: Chrome-plated brass.
   8. Seats and Seals: Replaceable.
   9. End Connections: Solder joint or threaded.
   10. Handle: Vinyl-covered steel with memory-setting device.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Water-Temperature Limiting Devices:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Leonard Valve Company.
      b. Powers; a Watts Industries Co.
      c. Symmons Industries, Inc.
      d. Taco, Inc.
      e. Watts Industries, Inc.; Water Products Div.
      f. Zurn Plumbing Products Group; Wilkins Div.

   2. Standard: ASSE 1017.
   3. Pressure Rating: 125 psig.
   4. Type: Thermostatically controlled water mixing valve.
   5. Material: Bronze body with corrosion-resistant interior components.

6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: See Drawings if applicable.
9. Tempered-Water Design Flow Rate: See Drawings if applicable.
10. Valve Finish: Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong International, Inc.
b. Lawler Manufacturing Company, Inc.
c. Leonard Valve Company.
d. Powers; a Watts Industries Co.
e. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
9. Tempered-Water Setting: See Drawings if Applicable.
10. Tempered-Water Design Flow Rate: See Drawings if applicable.
11. Pressure Drop at Design Flow Rate: See Drawings if applicable.
12. Valve Finish: Rough bronze.
13. Piping Finish: Copper.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

a. Strainers NPS 2 and Smaller: 0.033 inch.
b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
c. Strainers NPS 5 and Larger: 0.125 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.6 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves :

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.7 WATER HAMMER ARRESTERS

A. Water Hammer Arresters : WHA

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AMTROL, Inc.
   b. Josam Company.
   c. MIFAB, Inc.
   d. PPP Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   g. Tyler Pipe; Wade Div.
   h. Watts Drainage Products Inc.
   i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants FPWH:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. Prier Products, Inc.

d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Woodford Manufacturing Company.
h. Zurn Plumbing Products Group; Light Commercial Operation.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
4. Pressure Rating: 125 psig.
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4.
8. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Box: Deep, flush mounting with cover.
10. Box and Cover Finish: Polished nickel bronze.
11. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
12. Nozzle and Wall-Plate Finish: Polished nickel bronze.
13. Operating Keys(s): Two with each wall hydrant.

B. Vacuum Breaker Wall Hydrants HB:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrowhead Brass Products, Inc.
b. Mansfield Plumbing Products LLC.
c. McDonald, A. Y. Mfg. Co.
d. Prier Products, Inc.
e. Smith, Jay. R. Mfg. Co.; Division of Smith Industries, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Woodford Manufacturing Company.
h. Zurn Plumbing Products Group; Light Commercial Operation.

3. Standard: ASSE 1019, Type A or Type B.
4. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
5. Classification: Type A, for automatic draining with hose removed.
6. Pressure Rating: 125 psig.
7. Operation: Wheel handle.
8. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
9. Inlet: NPS 1/2.
10. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.9 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves :
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. MIFAB, Inc.
      b. PPP Inc.
      c. Sioux Chief Manufacturing Company, Inc.
      d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      e. Watts Industries, Inc.; Water Products Div.

   2. Standard: ASSE 1018.
   3. Pressure Rating: 125 psig minimum.
   4. Body: Bronze.
   5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
   6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
   7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Floor Drain Trap Guard
   1. Manufacturer: ProSet Systems
   2. Elastomeric Seal.
   3. Subject to Approval of Authority having jurisdiction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

   1. Locate backflow preventers in same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
   3. Install bypass piping around backflow preventers and water pressure regulator.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.

E. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

F. Install water hammer arresters in water piping according to PDI-WH 201.

G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow. Install trap guard type subject to Authority having jurisdiction.

H. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

I. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

J. Install thermometers at locations indicated on water heater piping diagram and hot water circulation pump detail.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer and double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable flow of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 1119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

A. This Section includes the following all-bronze and bronze-fitted centrifugal pumps for domestic cold- and hot-water circulation:

1. Close-coupled, in-line, seal-less centrifugal pumps.
2. Close-coupled, horizontally mounted, in-line centrifugal pumps.

1.3 SUBMITTALS

A. Product Data: For each type and size of domestic water pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CLOSE-COUPLED, IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Manufacturers:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Industries.
3. Grundfos Pumps Corp.
4. Taco, Inc.

B. Description: Factory-assembled and -tested, single-stage, close-coupled, in-line, seal-less centrifugal pumps as defined in HI 5.1-5.6.

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
2. Casing: Bronze, with threaded companion-flange connections.
3. Impeller: Corrosion-resistant material.
4. Motor: Single speed, unless otherwise indicated. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

C. Capacities and Characteristics: Refer to Schedule on Drawings.

2.3 CLOSE-COUPLED, HORIZONTALLY MOUNTED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Industries.
3. Marshall Engineered Products Co.
4. Paco Pumps, Inc.
5. Thrush Company, Inc.
6. Weinman Div.; Crane Pumps & Systems.

B. Description: Factory-assembled and -tested, overhung impeller, single-stage, close-coupled, horizontally mounted, in-line centrifugal pumps as defined in HI 1.1-1.2 and HI 1.3; and designed for installation with pump and motor shafts mounted horizontally.

1. Pump Construction: All bronze or bronze fitted.

a. Casing: Radially split, cast iron, with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
b. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, and keyed to shaft.
c. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.
d. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal.
e. Bearings: Oil-lubricated; bronze-journal or ball type.

2. Shaft Coupling: Rigid type if pump is provided with coupling.
3. Motor: Single speed, with grease-lubricated ball bearings. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

C. Capacities and Characteristics: Refer to Schedule on Drawings.

2.4 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Manufacturers:

    a. Honeywell International, Inc.
    b. Square D.
    c. White-Rodgers Div.; Emerson Electric Co.
    d. TACO
    e. Bell & Gossett
    f. Grundfos

2. Type: Water-immersion sensor or pipe mounted for installation on hot-water circulation piping.
3. Range 65 to 200 deg F.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 V, ac.
7. Settings: Start pump at 105 deg F (and stop pump at 115 deg F) for 120 deg F system.
8. Settings: Start pump at 125 deg F (and stop pump at 135 deg F) for 140 deg F system.

B. Timers: Electric time clock for control of hot-water circulation pump.

1. Manufacturers:

    a. Honeywell International, Inc.
    b. Intermatic, Inc.
    c. Johnson Controls, Inc.
    d. TACO
    e. BELL & GOSSETT
    f. GRUNDFOS

2. Type: Programmable, seven-day clock with manual override on-off switch.
3. Enclosure: Suitable for wall mounting or shelf.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 V, ac.
7. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

2.5 FLEXIBLE CONNECTORS

A. Available Manufacturers:

1. Anamet, Inc.
2. Flex-Hose Co., Inc.
3. Flexicraft Industries.
4. Flex-Pression, Ltd.
5. Flex-Weld, Inc.
6. Hyspan Precision Products, Inc.
7. Mercer Rubber.

8. Metraflex, Inc.
9. Proco Products, Inc.
10. Tozen America Corporation.
11. Unaflex Inc.
12. Twin City Hose

B. Description: Corrugated, bronze inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze-welded to tubing. Include 125-psig minimum working-pressure rating and ends matching pump connections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install close-coupled, horizontally mounted, in-line centrifugal pumps with motor and pump shafts horizontal.

E. Install continuous-thread hanger rods and elastomeric hangers, spring hangers of sufficient size Mechanical Vibration to support pump weight. Fabricate brackets or supports as required. Hanger and support materials are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

F. Install pipe mounted thermostats in hot-water return piping.

G. Install timers on shelf or wall and in proximity to water heater.

H. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

I. Install piping adjacent to pumps to allow service and maintenance.

J. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles. Refer to Division 22 Section "Domestic Water Piping."

1. Install flexible connectors adjacent to pumps in suction and discharge piping of close-coupled, horizontally mounted, in-line centrifugal pumps.
2. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping. Refer to Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty valves for domestic water piping and Division 22 Section "Domestic Water Piping Specialties" for strainers.
3. Install pressure gages at suction and discharge of pumps. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and gage connectors.

K. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

M. Connect thermostats and timers to pumps that they control.

N. Interlock pump with water heater burner and time delay relay.

END OF SECTION 221123

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:
   1. Pipe, tube, and fittings.
   2. Special pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

   1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 SANITARY WASTE AND VENT PIPING MATERIAL

A. Hub-and-Spigot, Cast-Iron Pipe and Fittings: ASTM-A 74, Service class.

1. Gaskets: ASTM C 564, rubber.

B. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.

1. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
b. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

C. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.

D. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
2. Solvent Cement and Adhesive Primer:

a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground, soil and waste piping NPS 3 and smaller shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

D. Aboveground, soil and waste piping NPS 4 and larger shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; heavy-duty, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

E. Aboveground soil, waste, and vent piping NPS 5 and larger shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; heavy-duty, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

F. Underground, soil, waste, and vent piping NPS 3 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; heavy duty shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid wall PVC Pipe ASTM D 2665 drain, waste and vent; PVC socket fittings ASTM D 2665, made to ASTM D 3311 drain, waste and vent patterns and to fit Schedule 40 pipe; ASTM D 2665 solvent cemented joints.

G. Underground, soil and waste Piping NPS 4 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; heavy-duty, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid wall PVC Pipe ASTM D 2665 drain, waste and vent; PVC socket fittings ASTM D 2665, made to ASTM D 3311 drain, waste and vent patterns and to fit Schedule 40 pipe; ASTM D 2665 solvent cemented joints.

3.2 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing".

B. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Common Work Results for Plumbing."

C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change

direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Hubless Joints: Make with rubber gasket and sleeve or clamp.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.4 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment"

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.

H. Install supports for vertical copper tubing every 10 feet.
1. Install hangers for and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
2. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
3. NPS 3: 48 inches with 1/2-inch rod.
4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
5. NPS 6: 48 inches with 3/4-inch rod.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures".
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.6 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.7 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.
4. Flashing materials.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts CO:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.

e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head plastic plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts FCO:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company; Josam Div.
b. Oatey.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group; Light Commercial Operation.
h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: Threaded.
8. Closure: Cast-iron plug Plastic plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Polished bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts WCO:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.

f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains FD-1:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Commercial Enameling Co.
   b. Josam Company; Josam Div.
   c. MIFAB, Inc.
   d. Prier Products, Inc.
   e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   f. Tyler Pipe; Wade Div.
   g. Watts Drainage Products Inc.
   h. Zurn Plumbing Products Group; Light Commercial Operation.
   i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Not required.
7. Clamping Device: Required.
8. Outlet: Bottom or side as required.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Stainless-steel.
13. Top of Body and Strainer Finish: Stainless-steel.
14. Top Shape: Round.
15. Dimensions of Top or Strainer: 5” Dia.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Trap Material: Cast iron.
19. Trap Pattern: Standard P-trap.
20. Trap Features: Trap-seal primer valve drain connection or mechanical trap guard.

B. Cast-Iron Floor Drains FD-2:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Commercial Enameling Co.
    b. Josam Company; Josam Div.
    c. MIFAB, Inc.
    d. Prier Products, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Light Commercial Operation.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Penal floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Sde.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Nickel-Bronze.
13. Top of Body and Strainer Finish: Nickel-Bronze.
14. Top Shape: Round.
15. Dimensions of Top or Strainer: 6-5/8” Dia.
16. Top Loading Classification: Light Duty.
17. Funnel: Not Required.
18. Trap Material: Cast iron.
19. Trap Pattern: Security P-trap.
20. Trap Features: Trap-seal primer valve drain connection or mechanical trap guard.

C. Cast-Iron Floor Drains FD-3:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Commercial Enameling Co.
    b. Josam Company; Josam Div.
    c. MIFAB, Inc.
    d. Prier Products, Inc.
    e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    f. Tyler Pipe; Wade Div.
    g. Watts Drainage Products Inc.
    h. Zurn Plumbing Products Group; Light Commercial Operation.

i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Not required.
7. Clamping Device: Not required.
8. Outlet: Bottom.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel coating.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Cast Iron.
13. Top of Body and Strainer Finish: Cast Iron.
14. Top Shape: Round.
15. Dimensions of Top or Strainer: 9” Dia.
16. Top Loading Classification: Medium Duty.
17. Funnel: Required.
18. Trap Material: Cast iron.
19. Trap Pattern: Standard P-trap.
20. Trap Features: Trap-seal primer valve drain connection or mechanical trap guard.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps :

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

a. NPS 2: 4-inch- minimum water seal.
b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install deep-seal traps on floor drains and other waste outlets, if indicated.

G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

H. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in

addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 1319

SECTION 223400 - FUEL-FIRED DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial, power-vent, gas-fired, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of commercial, gas-fired domestic-water heater, from manufacturer.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1) Storage Tank: Five years.
2) Controls and Other Components: One year(s).

b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 Commercial, Gas-Fired, Storage, Domestic-Water Heaters

A. Commercial, Power-Vent, Gas-Fired, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bradford White Corporation.
(Model: EF-100T-299E-5A)
b. Lochinvar Corporation.
c. Rheem Manufacturing Company.
d. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.

2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
4. Storage-Tank Construction: ASME-code steel with 150-psig working-pressure rating.

a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Lining: Glass complying with NSF 61 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

5. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
e. Jacket: Steel with enameled finish.
f. Burner: For use with power-vent, gas-fired, domestic-water heaters and natural-gas fuel.
g. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 199, electric, automatic, gas-ignition system.
h. Temperature Control: Adjustable thermostat.

i. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
j. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

6. Special Requirements: NSF 5 construction.
7. Power-Vent System: Exhaust fan, interlocked with burner.

B. Capacity and Characteristics (GWH-A):

1. Capacity: 100 gal.
2. Recovery: 223 gph at 100 deg F temperature rise.
3. Temperature Setting: 140 deg F.
4. Fuel Gas Demand: 199 cfh.
5. Fuel Gas Input: 199,000 Btu/h.
6. Gas Pressure Regulator:

a. Capacity: 300 cfh.
b. Inlet Pressure: 10 inches water column.
c. Gas Pressure Required at Burner: 7-10 inches water column.

7. Electrical Characteristics:

a. Volts: 120.
b. Phase: Single.
c. Hertz: 60.
d. Full-Load Amperes: 6.2.
e. Maximum Overcurrent Protection: 15.

8. Minimum Vent Diameter: 4 inches.

2.2 Domestic-Water Heater Accessories

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL Inc.
b. Flexcon Industries.
c. Honeywell International Inc.
d. Pentair Pump Group (The); Myers.
e. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
f. State Industries.
g. Taco, Inc.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
3. Construction:

    a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
    b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
    c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

    a. Working-Pressure Rating: 150 psig.
    b. Capacity Acceptance: 3.2 gal. minimum.
    c. Air Pre-charge Pressure: 40 psig.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and calibrated balancing valves to provide balanced flow through each domestic-water heater.

1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."
2. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

G. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 7” w.c. pressure rating as required to match gas supply.

H. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

I. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water

heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

J. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

K. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

L. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater a minimum of 18 inches (457 mm) above the floor.

M. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 Domestic-Water Heater Installation

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

C. Install gas-fired, domestic-water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

G. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet.

Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

H. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

I. Fill domestic-water heaters with water.

J. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION 22 3400

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Faucets for lavatories and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Dishwasher air-gap fittings.
7. Water closets.
8. Urinals.
9. Lavatories.
10. Kitchen sinks.
11. Service sinks.
12. Laundry trays.

B. Related Sections include the following:

1. Division 22 Section "22 1319 Sanitary Waste Piping Specialties."

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. FRP: Fiberglass-reinforced plastic.

D. PMMA: Polymethyl methacrylate (acrylic) plastic.

E. PVC: Polyvinyl chloride plastic.

F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-and stain-resistance qualities.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Laundry Trays: ANSI Z124.6.
3. Plastic Shower Enclosures: ANSI Z124.2.
4. Plastic Sinks: ANSI Z124.6.
5. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
6. Slip-Resistant Bathing Surfaces: ASTM F 462.
7. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
8. Stainless-Steel Residential Sinks: ASME A112.19.3.
9. Vitreous-China Fixtures: ASME A112.19.2M.
10. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
11. Water-Closet, Flushometer Tank Trim: ASSE 1037.

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.

4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Dishwasher Air-Gap Fittings: ASSE 1021.
4. Manual-Operation Flushometers: ASSE 1037.
5. Plastic Tubular Fittings: ASTM F 409.
6. Brass Waste Fittings: ASME A112.18.2.
7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

I. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Dishwasher Air-Gap Fittings: ASSE 1021.
3. Flexible Water Connectors: ASME A112.18.6.
4. Grab Bars: ASTM F 446.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Hot-Water Dispensers: ASSE 1023 and UL 499.
7. Off-Floor Fixture Supports: ASME A112.6.1M.
8. Pipe Threads: ASME B1.20.1.
9. Plastic Toilet Seats: ANSI Z124.5.
10. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS – Refer to Drawings for “Plumbing Fixture Specification Schedule”

2.1 FIXTURE SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.

4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

C. Water-Closet Supports:

1. Description: Combination carrier designed for accessible or standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

D. Urinal Supports, <Insert drawing designation>:

1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

E. Lavatory Supports:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

F. Lavatory Supports:

1. Description: Type III, lavatory carrier with hanger plate and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

G. Sink Supports, <Insert drawing designation>:

1. Description: Type II, sink carrier with hanger plate, bearing studs, and tie rod for sink-type fixture. Include steel uprights with feet.

2.2 DISHWASHER AIR-GAP FITTINGS

A. Dishwasher Air-Gap Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. B & K Industries, Inc.
b. Brass Craft Mfg. Co.; a Subsidiary of Masco Corporation.
c. Brasstech Inc.; Newport Brass Div.

d. Dearborn Brass; a div. of Moen, Inc.
e. Geberit Manufacturing, Inc.
f. JB Products; a Federal Process Corporation Company.
g. Sioux Chief Manufacturing Company, Inc.
h. Watts Brass & Tubular; a division of Watts Regulator Co.

3. Description: Fitting suitable for use with domestic dishwashers and for deck mounting; with plastic body[, chrome-plated brass cover; and capacity of at least 5 gpm; and inlet pressure of at least 5 psig at a temperature of at least 140 deg F. Include 5/8-inch-ID inlet and 7/8-inch-ID outlet hose connections.
4. Hoses: Rubber and suitable for temperature of at least 140 deg F.

a. Inlet Hose: 5/8-inch ID and 48 inches long.
b. Outlet Hose: 7/8-inch ID and 48 inches long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

L. Install toilet seats on water closets.

M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install shower flow-control fittings with specified maximum flow rates in shower arms.

Q. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on fixtures with solids interceptor.
3. Exception: Omit trap on indirect wastes, unless otherwise indicated.

R. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install **in sink deck**. Connect inlet hose to dishwasher and outlet hose to disposer.

S. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

T. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 4000

SECTION 224713 - DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Style W, wall-mounting drinking fountains.
2. Fixture supports.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

2.2 DRINKING FOUNTAINS

A. Drinking Fountains, EWC-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or comparable fixture by one of the following manufacturers:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation.

2. Description: Accessible, Style W, wall-mounting bi-level drinking fountain.

a. Material: Stainless steel.
b. Receptor Shape: Rectangular or Rounded front.
c. Back Panel: Stainless-steel wall plate behind drinking fountain.
d. Bubblers: One per fountain, with adjustable stream regulator, located on deck.
e. Refrigeration Capacity: 8.0 gph of 50F water with 80F entering water and 90F ambient.
f. Water Bottle Filler: One per bi-level fountain with LCD display. Located on back panel of low ADA fountain.
g. Water Filter: Lead, microplastics, chlorine taste/odor (NSF/ANSI 42.53 & 401).
h. Water Filter Capacity: 10,000 gallons.
i. Control: Push button.
j. Supply: NPS 3/8 with ball, gate, or globe valve.
k. Drain: Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.2.
l. Support: Type II, water cooler carrier. Refer to "Fixture Supports" Article.

2.3 FIXTURE SUPPORTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Co.
2. MIFAB Manufacturing, Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

C. Description: ASME A112.6.1M, water cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.

1. Type I: Hanger-type carrier with two vertical uprights.
2. Type II: Bilevel, hanger-type carrier with three vertical uprights.
3. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Use carrier off-floor supports for wall-mounting fixtures, unless otherwise indicated.

B. Set freestanding and pedestal drinking fountains on floor.

C. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view.

3.2 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-mounting fixtures, unless otherwise indicated.

B. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 15 Section "Valves."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 15 Section "Basic Mechanical Materials and Methods."

F. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, traps, and risers, and with soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

C. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

END OF SECTION 22 4713

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.1 SUMMARY

A. This Section includes the following:
   1. Dielectric fittings.
   2. Mechanical sleeve seals.
   3. Sleeves.
   4. Escutcheons.
   5. Equipment installation requirements common to equipment sections.
   6. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.2 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.3 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated and rough brass.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.2 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

END OF SECTION 23 05 00

SECTION 23 05 13- COMMON MOTOR REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers:

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. See Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

C. See Division 23 Section "Metal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.

3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.
7. <**Insert manufacturer's name.**>

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F. pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F. piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers,

and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

SECTION 23 05 53 - IDENTIFICATION FOR HVAC DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Duct labels.

1.3 SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 DUCT LABELS

A. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean ductwork and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For supply and outside-air ducts.
2. Green: For exhaust and return-air ducts.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Constant-volume air systems.

2. Verifying that automatic control devices are functioning properly.
3. Reporting results of activities and procedures specified in this Section.

1.3 SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

B. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

C. Warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

1.5 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Verify that balancing devices, such as balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities

and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine strainers for clean screens and proper perforations.

M. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine equipment for installation and for properly operating safety interlocks and controls.

O. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
5. Sensors are located to sense only the intended conditions.
6. Sequence of operation for control modes is according to the Contract Documents.
7. Controller set points are set at indicated values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to indicated values.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 TOLERANCES

A. Set HVAC system airflow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.

3.8 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Balancing stations.
5. Position of balancing devices.

END OF SECTION 23 0593

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Tapes.
8. Securements.

B. Related Sections:
1. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail application of field-applied jackets.
3. Detail application at linkages of control devices.
4. Detail field application for each equipment type.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per

ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Owens Corning; All-Service Duct Wrap.

B. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.

d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-10.
b. Foster Products Corporation, H. B. Fuller Company; 35-00.
c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
d. Marathon Industries, Inc.; 550.
e. Mon-Eco Industries, Inc.; 55-50.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.6 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.7 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Products; Bands.
   b. PABCO Metals Corporation; Bands.
   c. RPR Products, Inc.; Bands.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness

indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Through-Penetration Firestop Systems."

3.4 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F. at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and

over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. Inspect ductwork, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and return air.
2. Indoor, exposed supply and return air.

B. Items Not Insulated:
1. Factory-insulated flexible ducts.
2. Flexible connectors.
3. Vibration-control devices.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Exposed in Attic, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Exposed in Attic, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket 2 inches thick and 1.5-lb/cu. ft. nominal density.

E. Exposed in Attic, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket 2 inches thick and 1.5-lb/cu. ft. nominal density.

F. Exposed in Attic, Outside-Air Duct and Plenum Insulation: Mineral-fiber blanket 2 inches thick and 1.5-lb/cu. ft. nominal density.

END OF SECTION 23 07 00

SECTION 23 1123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig (3.45 kPa) or less.

C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Welding certificates.

C. Field quality-control reports.

D. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. OmegaFlex, Inc.
    b. Parker Hannifin Corporation; Parflex Division.
    c. Titeflex.
    d. Tru-Flex Metal Hose Corp.

2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.

    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

        1) Flame-Spread Index: 25 or less.
        2) Smoke-Developed Index: 50 or less.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without

gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.

5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig.

C. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K .

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.

    a. Copper fittings with long nuts.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads complying with ASME B1.20.3.

3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches.

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.

d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Lee Brass Company.
b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Electrically Operated Valves: Comply with UL 429.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ASCO Power Technologies, LP; Division of Emerson.
b. Dungs, Karl, Inc.
c. Eclipse Combustion, Inc.
d. Goyen Valve Corp.; Tyco Environmental Systems.
e. Magnatrol Valve Corporation.
f. Parker Hannifin Corporation; Climate & Industrial Controls Group; Skinner Valve Div.
g. Watts Regulator Co.; Division of Watts Water Technologies, Inc.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: or comparable product by one of the following:

a. Actaris.
b. American Meter Company.
c. Eclipse Combustion, Inc.
d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
e. Invensys.
f. Maxitrol Company.
g. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Canadian Meter Company Inc.
b. Eaton Corporation; Controls Div.
c. Harper Wyman Co.
d. Maxitrol Company.
e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

2.7 DIELECTRIC UNIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Capitol Manufacturing Company.
2. Central Plastics Company.
3. Hart Industries International, Inc.
4. McDonald, A. Y. Mfg. Co.
5. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
6. Wilkins; Zurn Plumbing Products Group.

B. Minimum Operating-Pressure Rating: 150 psig.

C. Combination fitting of copper alloy and ferrous materials.

D. Insulating materials suitable for natural gas.

E. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.8 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico Inc.
    c. Metraflex Company (The).
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.10 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

E. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

F. Install fittings for changes in direction and branch connections.

G. Install pressure gage downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.2 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping."

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Division 22 Section "Meters and Gages for Plumbing Piping".

3.3 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.5 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hangers and supports specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment".

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.6 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping **NPS 1** and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be **one of** the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.10 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.11 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, regular-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, regular-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, regular-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 23 1123

SECTION 23 2300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B) or ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Reverse-flow option (for heat-pump applications).
7. End Connections: Socket, flare, or threaded union.

8. Working Pressure Rating: 700 psig .

H. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig .
5. Maximum Operating Temperature: 275 deg F.

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig .
6. Maximum Operating Temperature: 275 deg F.

J. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig
9. Maximum Operating Temperature: 240 deg F.

L. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.

B. Liquid Lines: Copper Type ACR, annealed-temper tubing and wrought-copper fittings with soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR K (A) L (B), drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at strainers if they are not an integral part of strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.
c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 2300

SECTION 23 3113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Single-wall, round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:
1. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.

1. Static-Pressure Classes:
    1. Supply Ducts (Upstream from Air Terminal Units): 3-inch wg.
    2. Supply Ducts (Downstream from Air Terminal Units): 1-inch wg.
    3. Return Ducts (Negative Pressure): 1-inch wg.
    4. Exhaust Ducts (Negative Pressure): 1-inch wg.

2. Leakage Class:

    1. Round or flat oval Supply-Air Duct: 3 cfm/100 sq. ft. at 1-inch wg.
    2. Rectangular Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg.
    3. Flexible Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment. and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    1. Lighting fixtures.
    2. Air outlets and inlets.
    3. Speakers.
    4. Sprinklers.
    5. Access panels.

6. Perimeter moldings.

E. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.

B. Round, Longitudinal and Spiral Lock Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA’s “HVAC Duct Construction Standards- Metal and Flexible.”

C. Flat-Oval, Longitudinal- and Spiral Lock Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards – Metal and Flexible." Fabricate ducts larger than 72 inches in diameter with butt-welded longitudinal seams.

1. Manufacturers:
    1. McGill Airflow Corporation
    2. SEMCO Incorporated.

D. Duct Joints:
1. Ducts up to 20 inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

2. Ducts 21 to 72 inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.

3. Ducts Larger than 72 inches in Diameter: Companion angle flanged joints per SMACNA "HVAC Duct Construction Standards- Metal and Flexible "Figure 3-2.

4. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
    1. Manufacturers:
        1) Ductmate Industries, Inc.
        2) Lindab, Inc.

5. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.
    1. Manufacturers:
        1) Ductmate Industries, Inc.
        2) McGill Airflow Corporation.
        3) SEMCO Incorporated.

E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards- Metal and Flexible," unless otherwise indicated.

2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2 to plus 2 inch wg:
    1. Ducts 3 to 36 inches in Diameter: 0.034 inch.
    2. Ducts 37 to 50 inches in Diameter; 0.040 inch.
    3. Ducts 52 to 60 inches in Diameter: 0.052 inch.
    4. Ducts 62 to 84 Inches in Diameter; 0.064 inch.

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2 to 10 inch wg:
    1. Ducts 3 to 36 inches in Diameter: 0.034 inch.
    2. Ducts 27 to 50 inches in Diameter; 0.040 inch.
    3. Ducts 52 to 60 inches in Diameter: 0.052 inch.
    4. Ducts 62 to 84 Inches in Diameter; 0.064 inch.

4. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal-seam flat-oval duct.

5. 90-Degree, 2 Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.

6. Round elbows 8 inches and Less in Diameter: Fabricate die-formed elbows for 45 and 90 degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

7. Round Elbows 9 through 14 inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

8. Round Elbows Larger Than 14 inches in Diameter and All flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.

9. Die-formed Elbows for Sizes through 8 inches in Diameter and All Pressure 0.040 inch thick with 2 piece welded construction.

10. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.

11. Flat-Oval Elbow Metal Thickness: Same as longitudinal-seam flat-oval duct specified above.

12. Pleated Elbows for Sizes through 14 inches in Diameter and Pressure through 10-inch wg: 0.022 inch.

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.

6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation

with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 SEAM AND JOINT SEALING

A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

B. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel.

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Stainless-Steel Ducts: Galvanized steel.
3. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

    1. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

    2. Velocity 1000 to 1500 fpm:

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

    3. Velocity 1500 fpm or Higher:

        1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

1. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

    1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
    2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
    3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

2. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
3. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

    1. Rectangular Main to Rectangular Branch: 45-degree entry.
    2. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

    1. Velocity 1000 fpm or Lower: 90-degree tap.
    2. Velocity 1000 to 1500 fpm: Conical tap.
    3. Velocity 1500 fpm or Higher: 45-degree lateral.

3.6 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections according to SMACNA’s “HVAC Air Duct Leakage Test Manual” and prepare test reports.
1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
2. Conduct test at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give 7 days’ advance notice for testing.
3. Maximum Allowable Leakage: Comply with requirement for Leakage Class 3 for round and flat-oval ducts. Leakage Class 12 for rectangular ducts in pressure classes from 2” wg to 10” wg (both positive and negative) and Leakage Class 6 for pressure classes from 2” wg at to 10” wg.
4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

END OF SECTION 23 3113

SECTION 23 33 00- DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cesco Products; a division of Mestek, Inc.
2. Duro Dyne Inc.
3. Greenheck Fan Corporation.
4. Ruskin Company.
5. SEMCO Incorporated.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: 0.052-inch thick, galvanized sheet steel with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.

N. Sleeve: Minimum 20-gage thickness.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Flexmaster U.S.A., Inc.
   b. McGill AirFlow LLC.
   c. METALAIRE, Inc.
   d. Ruskin Company.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

   a. Hat-shaped, galvanized steel channels, 0.064-inch minimum thickness.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:
   a. Parallel- or opposed-blade design.
   b. Stiffen damper blades for stability.
   c. Galvanized steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.

7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arrow United Industries; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Duro Dyne Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. METALAIRE, Inc.
8. Ruskin Company.

B. Frames:

1. Hat shaped.
2. Galvanized steel channels, 0.064 inch thick.
3. Mitered and welded corners.

C. Blades:

1. Multiple blade with maximum blade width of 8 inches.
2. Opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.

D. Blade Axles: 1/2-inch diameter; galvanized steel blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

    a. Double wall, rectangular.
    b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    c. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
    d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 10-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch thick, fibrous-glass or polystyrene-foam board.

2.8 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.10 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches to suit duct size.

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.

I. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment.

K. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

L. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

M. Connect diffusers to low-pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

N. Connect flexible ducts to metal ducts with clamps.

O. Install duct test holes where required for testing and balancing purposes.

P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Inspect turning vanes for proper and secure installation.

END OF SECTION 23 33 00

SECTION 23 3423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Ceiling mounting ventilators.
   2. In-line centrifugal fans.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

C. UL Standard: Power ventilators shall comply with UL 705.

PART 2 - PRODUCTS

2.1 CEILING VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Greenheck.
   2. Loren Cook Company.
   3. Penn-Barry Corporation.

B. Description: Centrifugal fans designed for installing in ceiling.

C. Housing: Steel, lined with acoustical insulation.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

F. Grille: Aluminum louvered grille with flange on intake and thumbscrew attachment to fan housing.

G. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

2.2 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Greenheck.
   2. Loren Cook Company.
   3. Penn-Barry Corporation.

B. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
2. Companion Flanges: For inlet and outlet duct connections.
3. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.3 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Install ducts adjacent to power ventilators to allow service and maintenance.

E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Equipment."

F. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper

thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 23 3423

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Rectangular and square ceiling diffusers.
   2. Adjustable bar registers and grilles.

B. Related Sections:
   1. Division 23 Section "Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

A. Rectangular and Square Ceiling Diffusers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Anemostat Products; a Mestek company.
      b. Krueger.
      c. METALAIRE, Inc.
      d. Titus.
      e. Price Industries.

   2. Devices shall be specifically designed for variable-air-volume flows.

   3. Material: Steel.
   4. Finish: Baked enamel, white

5. Face Size: 24 by 24 inches or 12 by 12 inches.
6. Face Style: Louvered.
7. Mounting: T-bar for lay-in installation.
8. Pattern: Adjustable.
9. Dampers: Radial opposed blade.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Anemostat Products; a Mestek company.
      b. Krueger.
      c. METALAIRE, Inc.
      d. Titus.
      e. Price Industries.

   2. Material: Steel or aluminum.
   3. Finish: Baked enamel, white.
   4. Face Blade Arrangement: Horizontal.
   5. Core Construction: Removable.
   6. Rear-Blade Arrangement: Vertical.
   7. Damper Type: Adjustable opposed blade

B. Adjustable Bar Grille:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Anemostat Products; a Mestek company.
      b. Krueger.
      c. METALAIRE, Inc.
      d. Titus.
      e. Price Industries.

   2. Material: Steel or aluminum.
   3. Finish: Baked enamel, white.
   4. Face Blade Arrangement: Horizontal.
   5. Core Construction: Removable.
   6. Rear-Blade Arrangement: Vertical.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 235533 - FUEL-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gas-fired unit heaters.

1.2 SUBMITTALS

A. Product Data: For each type of fuel-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace heat exchanger of fuel-fired unit heater that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GAS-FIRED UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Modine Manufacturing Company.
2. Reznor/Thomas & Betts Corporation.
3. Sterling HVAC Products; Div. of Mestek Technology Inc.

B. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.

C. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.

D. Type of Venting: Indoor, separated combustion, power vented.

E. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.

F. Heat Exchanger: Stainless steel.

G. Burner Material: Stainless steel.

H. Unit Fan: Propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.

I. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.

1. Gas Control Valve: Modulating.
2. Ignition: Electronically controlled electric spark with flame sensor.
3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
4. Vent Flow Verification: Differential pressure switch to verify open vent.
5. Control transformer.
6. High Limit: Thermal switch or fuse to stop burner.
7. Thermostat: Single-stage, wall-mounting type with 50 to 90 deg F (10 to 32 deg C) operating range and fan on switch.
8. Thermostat: 2-stage, wall-mounting type with 50 to 90 deg F (10 to 32 deg C) operating range and fan on switch.

J. Discharge Louvers: Independently adjustable horizontal blades.

K. Accessories:
1. Four-point suspension kit.
2. Power Venter: Centrifugal aluminized-steel fan, with stainless-steel shaft; 120-V ac motor.

3. Concentric, Terminal Vent Assembly: Combined combustion-air inlet and power-vent outlet with roof caps. Include adapter assembly for connection to inlet and outlet pipes, and flashing for roof penetration.

L. Capacities and Characteristics: Refer to the equipment schedule on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and connect gas-fired unit heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.

B. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

C. Install piping adjacent to fuel-fired unit heater to allow service and maintenance.

D. Gas Piping: Comply with Division 23 Section "Facility Natural-Gas Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

E. Vent Connections: Comply with Division 23 Section "Breechings, Chimneys, and Stacks."

F. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

G. Adjust initial temperature set points.

H. Adjust burner and other unit components for optimum heating performance and efficiency.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 235533

SECTION 23 7413 – PACKAGED ROOFTOP AIR CONDITIONING UNITS

Part 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SYSTEM DESCRIPTION

A. Outdoor, rooftop mounted, electrically controlled heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressors for cooling duty and gas combustion for heating duty.
B. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features prior to field start-up.
C. Unit shall use environmentally sound, R-454B refrigerant.
D. Unit shall be installed in accordance with manufacturer's instructions.
E. Unit must be selected and installed in compliance with local, state, and federal codes.

F. Evaporator fan compartment:
1. Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, dual density fiber glass insulation with thermal conductivity of 0.52 or better, bonded with a phenolic binder.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

G. Gas heat compartment:
1. Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, dual density fiber glass insulation with thermal conductivity of 0.52 or better, bonded with a phenolic binder.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

H. Economizer and Control compartment:
1. Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, dual density fiber glass insulation with thermal conductivity of 0.52 or better, bonded with a phenolic binder.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

I. Partition and Duct Panel:
1. Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, dual density Fiber glass insulation with thermal conductivity of 0.52 or better, bonded with a phenolic binder.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

J. Base Pan:
1. Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.24 or better, adhered with acrylate polymer based adhesive
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.3 QUALITY ASSURANCE

A. Unit meets ASHRAE 90.1 minimum efficiency requirements.

B. Unit shall be rated in accordance with AHRI (Air-Conditioning, Heating, and Refrigeration Institute) Standards 210/240 or 340/360.

C. Unit shall be designed to conform to ASHRAE 15, 2001.

D. Unit shall be UL tested and certified in accordance with CSA/ANSI Z21.47:21/CSA 2.3:21, CAN/CSA-C22.2 No. 60335-2-40:22 and 60335-2-40-1-:16, and UL 60335-2-40 (4th edition).

E. Insulation and adhesive shall meet NFPA (National Fire Protection Association) 90A requirements for flame spread and smoke generation.

F. Unit shall be capable of withstanding 1000-hour salt spray exposure per ASTM B117 (scribed specimen).

G. Unit shall be designed in accordance with ISO 9001 and shall be manufactured in a facility registered by ISO 9001.

H. Roof curb shall be designed to NRCA (National Roofing Contractors Association) Standards.

I. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.

J. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.

K. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box.

L. Unit shake tested to assurance Truck 2, ASTM D4169 to ensure shipping reliability.

1.4 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled per manufacturer’s recommendations.

B. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.

C. Unit shall only be stored or positioned in the upright position.

Part 2 — PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   1. Carrier Corporation.
   2. Trane Company.
   3. Johnson Controls, Inc.
   4. McQuay.

2.2 EQUIPMENT

A. Operating Characteristics:
   1. Unit shall be capable of starting and running at 125°F ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ± 10% voltage.
   2. Compressor with standard controls shall be capable of operation down to 30° F, ambient outdoor temperatures.
   3. Unit shall discharge supply air downward as shown on contract drawings.
   4. Unit shall be factory configured for vertical supply and return configurations.
   5. Unit shall be field convertible from vertical to horizontal airflow on all models.
   6. Unit shall be capable of mixed operation: vertical supply with horizontal return or horizontal supply with vertical return.

B. Unit Cabinet:
   1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
   2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F): 80+/-5, Hardness: H-2H Pencil hardness.
   3. Unit cabinet shall have gas and electric utility knockouts in the side of the unit and in the unit underside. Base of unit shall have a minimum of four locations for through-the-base gas and electrical connections standard.
   4. Base Rail
      a. Unit shall have base rails on a minimum of 4 sides.
      b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
      c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
      d. Base rail shall be a minimum of 15 gauge thickness.
      e. Base rails will be constructed of single, rail-formed piece for increased strength.
   5. Condensate pan and connections:
      a. Shall be an internally sloped condensate drain pan made of a non-corrosive material.
      b. Shall comply with ASHRAE Standard 62.
      c. Shall use a 3/4” NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer’s recommendations.
   6. Top panel:
      a. Shall be a single piece top panel.
      b. Shall be embossed to increase rigidity and prevent sagging.

7. Gas Connections:
   a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit.
   b. Through-the-base capability
   (1.) Standard unit shall have a through-the-base gas line location using a raised, embossed portion of the unit base-pan.
   (2.) Optional, factory approved, water tight connection method must be used for through-the-base gas connections.
   (3.) No base-pan penetration, other than those authorized by the manufacturer, is permitted.

8. Electrical Connections
   a. All unit power wiring shall enter unit cabinet at a single, factory prepared, and knockout location.
   b. Through the base capability.
   (1.) Standard unit shall have a through-the-base electrical location(s) using a raised, embossed portion of the unit base-pan.
   (2.) Optional, factory approved, water tight connection method must be used for through-the-base electrical connections.
   (3.) No base-pan penetration, other than those authorized by the manufacturer, is permitted.

C. Evaporator Fan and Motor:

1. Evaporator Fan Motor:

   a. Shall have permanently lubricated ball-bearings.
   b. Shall have inherent automatic-reset thermal overload protection.
   c. The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.

   Evaporator Fan:

   a. Fan motor shall be standard belt drive assembly with an adjustable pitch motor pulley.
   b. Shall use sealed, permanently lubricated ball-bearing type.
   c. Blower fan shall be double-inlet type with forward-curved blades.
   d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

D. Condenser Fan and Motor:

1. Condenser Fan Motor:

   a. Shall be a totally enclosed motor.
   b. Shall use permanently lubricated ball-bearings.
   c. Shall have inherent thermal overload protection with an automatic reset feature.
   d. Shall use a shaft-down design.

   Condenser Fan:

a. Shall be direct-driven propeller type fan.
b. Shall have aluminum blades riveted to corrosion-resistant steel spider brackets and be dynamically balanced.

E. Compressors:
1. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
2. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
3. Compressors shall be internally protected from high discharge temperature conditions.
4. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
5. Compressor shall be factory mounted on rubber grommets.
6. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
7. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.

F. Coils:
1. Standard evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
2. Shall be leak tested to 150 psig, pressure tested to 250 psig, and qualified to CSA C22.2 No. 236- 1(UL1995) 4th edition burst test at 1775 psig.
3. Assembled unit shall be pressure tested to 400 psig.
4. Standard condenser coil shall have all aluminum microchannel design consisting of aluminum multi-port flat tube design al aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
5. Microchannel condenser coils shall be leak tested at 150 psig, pressure tested at 650 psig, and qualified to UL 1995 burst test at 1980 psig.
6. Assembled unit shall be pressure tested to 400 psig.

G. Gas Heat:
1. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
2. Shall incorporate a direct-spark ignition system and redundant main gas valve.
3. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
4. Heat exchanger installation is oriented to aid in condensate drainage.
5. 3 to 6 ton units shall have an option of 1 or 2 stages of gas heating.
6. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.
   a. IGC board shall notify users of fault using an LED (light emitting diode).
   b. The LED shall be visible without removing the control box access panel.
   c. Unit Control Board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.
   d. Unit shall be equipped with anti-cycle protection with one cycle on unit flame rollout switch or 3 short cycles on the high temperature limit switch. Fault indication shall be made using an LED.
7. Standard Heat Exchanger construction

a. Heat exchanger shall be of the tubular section type constructed of a minimum of 20 gauge steel coated with a T1-40 aluminum silicon alloy for corrosion resistance.
b. Burners shall be of the in-shot type constructed of aluminum-coated steel.
c. Burners shall incorporate orifices for rated heat output up to 2000 ft. elevation.
d. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.

H. Refrigerant Circuits:
1. All 3-6 ton units shall utilize a single refrigerant circuit.
2. Refrigerant circuit shall include the following control, safety, and maintenance features:
a. Unit shall use a Thermostatic Expansion Valve (TXV) or orifice for refrigeration control.
(1.) TXV shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
b. Refrigerant filter drier - Solid core design.
c. Service gauge connections on suction and discharge lines.

I. Panel Air Filters:
1. Shall consist of factory installed, low velocity, disposable 2-in. thick fiberglass filters of commercially available sizes.
2. Units can accept 2” or 4” filters and have a field convertible tool less transition.
3. Filters shall be accessible through an access panel; hinged panel with “no tool” removal option is available as described in the Special Features Options and Accessories section of this specification.

J. Controls and Safeties:
1. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability for 3-6 ton XY products.
2. Shall utilize color-coded wiring.
3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.

Safeties:
1. Compressor over-temperature, over-current. High internal pressure differential.
2. Low pressure switch and high pressure switch
a. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. Automatic reset, motor thermal overload protector.
4. Heating section shall be provided with the following minimum protections:
a. High temperature limit switches.
b. Induced draft pressure sensor.
c. Flame rollout switch.
d. Flame proving controls.

K. Electrical Requirements:
1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

L. Special Features:
1. Standard Integrated Economizer:
a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory installed option.
c. Damper blades shall be galvanized steel with metal gears. Plastic or composite blades on intake or return shall not be acceptable.
d. Damper blades shall be class 1A dampers.
e. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
f. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
g. Economizer shall comply with, and be certified to, the AMCA 511 standard.
h. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft2 leakage at 1 in. wg pressure differential.
i. Economizer controller shall be the Johnson Controls SE Economizer Controller
(1.) On board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
(2.) Sensor failure loss of communication identification
(3.) Automatic sensor detection
(4.) Capabilities for use with multiple-speed indoor fan systems
(5.) Utilize digital sensors: Dry bulb and Enthalpy
(6.) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47
j. Shall be capable of introducing up to 100% outdoor air.
k. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
l. Shall be designed to close damper(s) during loss of power situations with spring return built into motor.
m. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory installed only. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F. Additional sensor options shall be available as accessories.
n. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
o. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
p. Dampers shall be completely closed when the unit is in the unoccupied mode.
q. Economizer controller shall accept a 2-10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
r. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.

s. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.

2. Barometric Relief Kit
   a. Shall contain all materials necessary to field install a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.

3. Condenser Coil Hail Guard Assembly (Factory or field installed only)
   a. Shall protect against damage from hail.
   b. Louvered style.

4. Unit Mounted, Non Fused Disconnect Switch:
   a. Switch shall be factory installed, internally mounted.
   b. National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff.
   c. Shall be accessible from outside the unit.
   d. Shall provide local shutdown and lockout capability.

5. Convenience Outlet:
   a. Non-Powered convenience outlet.
   (1.) Outlet shall be powered from a separate 115/120v power source.
   (2.) A transformer shall not be included.
   (3.) Outlet shall be factory installed and internally mounted with easily accessible 115-v female receptacle.
   (4.) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
   (5.) Outlet shall be accessible from outside the unit.

6. Roof Curbs (Vertical):
   a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.
   b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
   c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

7. Dual Enthalpy Sensor Kit:
   a. The dual enthalpy sensor kit shall provide 2 relative humidity sensors to be mounted in the return and outdoor air streams to provide dual enthalpy economizer control.
   b. This kit contains all components required for dual enthalpy control and does not need to be used in conjunction with the Single Enthalpy Sensor Kit.

8. Phase Monitor
   a. Shall provide protection against phase reversal, phase loss, and phase unbalance.
   b. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.
   c. Shall have visual LED indication of operational status.

9. Hinged and tool less access panels (factory installed)
   a. Cabinet panels shall be hinged

b. Shall provide easy access with molded composite handles that are permanently attached and recessed into the panel.
c. Shall be on major panels of: filter, control box, fan motor, and compressor.

SECTION 23 8126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace split-system air-conditioning units that fail in materials and workmanship within five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hitachi.
   2. Mitsubishi Electronics America, Inc.; HVAC Division.
   3. Toshiba-Carrier.

2.2 EVAPORATOR-FAN UNIT

A. Unit Cabinet: Enameled steel with removable panels on front and ends.

   1. Discharge Grille: Steel with surface-mounted frame.
   2. Insulation: Faced, glass-fiber, duct liner.
   3. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2004.
   4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Evaporator Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motor: Multispeed.

E. Filters: 1 inch thick, in fiberboard frames.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER UNIT

A. Casing steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed reciprocating or scroll type with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F.

H. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to concrete pad.

3.2 CONNECTIONS

A. Connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

B. Install piping adjacent to unit to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 238126

SECTION 238216 - AIR COILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electric air coils that are not an integral part of air-handling units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil. Include rated capacity and pressure drop for each air coil.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance:
   1. Comply with ASHRAE 33 for methods of testing heating coils.
   2. Comply with applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

PART 2 - PRODUCTS

2.1 ELECTRIC COILS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Brasch Manufacturing Co., Inc.

2. Chromalox, Inc., Wiegand Industrial Division; Emerson Electric Company.
3. INDEECO.

B. Coil Assembly: Comply with UL 1995.

C. Heating Elements: Constructed of 80 percent nickel and 20 percent chromium; steps shall be arranged to prevent stratification when operating at less than full capacity.

D. Coil Terminals: Shall be of stainless steel, terminal insulators and bracket bushings shall be constructed of ceramic and securely positioned. Terminals shall be machined crimped to coil.

E. Frames: Constructed of heavy gauge galvanized steel top assure structural rigidity and have vertical galvanized steel supports with stiffening ribs and gussets spaced no more than 4” apart, spot welded to the casing.

F. Terminal Box: Provided with solid cover in order to minimize dust infiltration and shall be hinged. Heater terminal box must be totally enclosed and must be without perforated or expanded sheet metal covers, louvers, or grilles.

G. Safety Devices: A disc type automatic reset thermal cutout shall be furnished for primary over temperature protection. For secondary protection, a sufficient number of heat limiters in the power lines shall deenergize elements if the primary cutout fails. All safety devices shall be serviceable through the terminal box without removing the heating coil from the duct.

H. Wiring Diagrams: A separate, complete wiring diagram shall be furnished for each heater. Diagram shall include recommend supply wire gauges per NEC, and fuse sizes. Typical wiring diagrams are not acceptable. Each heater shall be complete with clearly marked power and control terminals.

I. Built-in Components: Heater shall include interlocking disconnect switch, disconnecting break magnetic contactors, transformer with primary fuses per UL, pressure type airflow switch set at 0.07” WC, branch circuit fuses per National Electrical Code, and a single terminal block to accept the number, type, and size of conductors as shown on the electrical plan.

J. Special Features: The following additional features shall be an integral part of each heater:

1. Manual Reset Thermal Cutout.
2. Magnetic Contractors.
3. SCR’s (for solid state modulation).

K. Refer to Division 23 Section "Automatic Temperature Controls” for thermostat.

L. Capacities and Characteristics: Refer to the equipment schedule on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install coils level and plumb.

B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."

C. Straighten bent fins on air coils.

D. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Connect wiring according to Division 26 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, operate electric coils to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 238216

SECTION 238239 - UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Propeller unit heaters with electric-resistance heating coils.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

   1. Plans, elevations, sections, and details.
   2. Location and size of each field connection.
   3. Equipment schedules to include rated capacities, furnished specialties, and accessories.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 PROPELLER UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airtherm; a Mestek Company.
2. Chromalox.
3. Trane.

B. Description: An assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.

C. Comply with UL 2021.

D. Cabinet: Removable panels for maintenance access to controls.

E. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

G. Discharge Louver: Adjustable fin diffuser for horizontal units.

H. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F. at any point during normal operation.

1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
2. Wiring Terminations: Stainless-steel or corrosion-resistant material.

I. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

J. Fan Motors: Comply with requirements in"" Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Type: Permanently lubricated.

K. Control Devices: Wall-mounting thermostat.

L. Capacities and Characteristics: Refer to the schedule on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install unit heaters to comply with NFPA 90A.

B. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

C. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

D. Comply with safety requirements in UL 1995.

E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238239

SECTION 26 0510 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. Contractor: “Contractor”, “this Contractor” or “Electrical Contractor” when used in this specification refers to the Contractor responsible for all work under this Section.

B. Sub Contractor: Any references to, or letting of work contained in these specifications to any Sub Contractor or manufacturer does not relieve this Contractor of his responsibility for all work, material and equipment in this specification.

C. Provide: The term “Provide” when used separately shall mean to “Furnish and Install”.

D. Furnish: The term “Furnish” when used separately shall mean to obtain and deliver to the project site for installation by others.

E. Install: The term “Install” when used separately shall mean to mount in place, connect and make operable.

F. Gauge of Materials: The sizes of copper conductors and thickness of metals shown on the drawings or mentioned herein shall be understood to be American Wire Gauge for conductors and US Gauge for sheet metal.

G. Singular Number: Any reference made to an item in the singular number shall apply equally to as many identical items that work may require.

1.3 REGULATIONS AND CODES

A. All applicable laws, ordinances, rules and regulations of public bodies bearing on the conduct of the work, including but not limited to, the State Department of Health, Department of Labor and Industry, the National Fire Protection Association, the Americans with Disabilities Act and the Owner’s insuring agency are hereby incorporated and made a part of these specifications.

B. Should any change in the drawings and/or specifications be required to conform to the codes, ordinances, regulations or laws mentioned above, the Architect shall be

notified prior to the time of submitting bids. After signing the Contract, each Contractor will be responsible for the completion of all work necessary to meet the above-mentioned requirements without additional expense to the Owner.

C. The Contractor shall comply with all rules, regulations and recommendations of any public utility serving this project.

D. The entire electrical system shall be installed in accordance with NFPA 70 - 2008 National Electric Code, approved by the governmental body having jurisdiction, including amendments thereto.

1.4 DRAWINGS AND SPECIFICATIONS

A. The drawings are generally diagrammatic and indicative of the work to be installed. Exact locations of equipment and points of termination shall be approved by the Architect. Should it be found that any system or equipment cannot be installed as shown on the drawings, the Architect shall be consulted before installing or making changes to the layout.

B. The drawings and specifications are intended to function as a common set of documents. Anything shown on the drawings but not in the specifications, or mentioned in the specifications and not shown on drawings, shall be equally binding as if both noted on the drawings and called for in the specifications.

C. No measurement of a drawing by scale shall be used as a working dimension. Working measurements shall be taken from figured dimensions and through cooperation with all other Contractors.

D. This Contractor shall carefully examine the Architectural, Structural, Mechanical, Plumbing and miscellaneous Contract Drawings and Specifications. If any discrepancies occur between the drawings or between the drawings and specifications, he shall report such discrepancies to the Architect in writing and obtain written instructions as to the manner in which to proceed. No departures from the Contract Drawings shall be made without prior written approval of the Architect.

1.5 FAMILIARITY WITH CONTRACT REQUIREMENTS

A. It is the responsibility of the Contractor, prior to submitting his bid on this Project, to satisfy himself as to the nature and location of the work, the conformation of the ground, soil characteristics, the character, quality and quantity of the materials which will be required, the character equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions and of all other matters which can in any way affect the work under this Contract.

B. Failure to make onsite inspection prior to submitting a bid, or failure to comply with any or all of the above requirements will not relieve this Contractor from the responsibilities of properly estimating the requirements or costs of successful

completion of the work nor from the responsibility for the performance of the provisions of this Contract.

1.6 STANDARDS AND REFERENCES

A. Products of workmanship that are specified by association, trade or federal standards shall comply with the requirements of the following reference standards except when more rigid requirements are specified or are required by applicable codes.

1. ANSI - American National Standard Institute
2. ASTM - American Society for Testing and Materials.
3. FM - Factory Mutual System.
4. FS - Federal Specification.
5. IEEE - Institute of Electrical and Electronics Engineers.
6. NEMA - National Electrical Manufacturers Association.
7. NFPA - National Fire Protection Association.
8. UL - Underwriters Laboratories, Inc.

1.7 SHOP DRAWINGS

A. The Contractor shall submit to the Architect shop drawings, catalog cuts, data sheets, manufacturer's instructions, etc. of all materials and equipment as called for herein and/or as called for in the individual sections of Division 26 under submittals.

B. Shop drawings submitted for review shall identify the Project, Contractor, Sub Contractor or Supplier, pertinent drawing number, detail and specification section number as appropriate.

C. Shop drawings shall bear the Contractor's approval stamp, signed or initialed certifying that review, verification of the material required, dimensions and coordination of the information is in accordance with the requirements of the work and Contract Documents. Drawings submitted without the Contractor's approval stamp will not be considered and will be returned for resubmission.

D. No work shall be executed, no orders placed, and no material shall be installed until final review has been received.

1.8 ELECTRICAL INSPECTION

A. The electrical work on this Project shall be inspected by an approved inspection agency. All inspection costs shall be paid by the Electrical Contractor. Any work failing to pass inspection shall be corrected and re-inspected at no additional cost to the Owner. The Electrical Contractor shall formally file for this inspection within 20 days of signing the Contract.

B. Submit 3 copies of final wiring certificates to the Architect.

1.9 OPERATION AND MAINTENANCE MANUALS

A. This Contractor shall compile, during process of work, complete operation and maintenance manuals including all approved electrical shop drawings. Methods of care of all types of materials and descriptions of all systems and equipment and methods of operation shall be provided. Descriptions shall give pertinent diagrams, identifying charts, color-coding, connections, lubricating instructions and single-line and detailed wiring diagrams. Use Manufacturer's printed information where possible; otherwise, obtain written instructions prepared by Sub Contractors. Include names, addresses and phone numbers of all Sub Contractors and of service firms for each item, for Owner's use after expiration of the guarantee period. The list shall be located immediately inside the front cover. Before completion of the work, submit a rough draft of the manual in a loose-leaf binder for approval.

B. After approval and before final payment, furnish 2 corrected bound copies, properly identified, to Professional for transmittal to the Owner.

1.10 GUARANTEE

A. Written 1 year full warranty guarantees shall be submitted for the entire electrical installation installed under this Project (except lamps). The emergency lighting system shall carry a full warranty guarantee for 3 years. Where Manufacturer's standard guarantee provides for a longer period, the longer period shall apply.

B. Where defects in the material, equipment and/or workmanship become evident within this guarantee period, the Contractor shall be responsible for replacing such material and equipment with the approved type of new items; and/or correcting the defective workmanship without any costs to the Owner.

1.11 CONSTRUCTION RECORD DRAWINGS:

A. The Contractor shall keep at the job site 1 complete set of drawings which shall be used by the Contractor for the purpose of recording all changes that occur during the construction. The Contractor shall accurately record on these drawings all changes in the electrical work.

B. Upon completion of this Project, these drawings shall be turned over to the Engineer.

1.12 SUBSTITUTIONS

A. All material specified hereinafter shall be of the Manufacturer's catalog number as specified. For prior approval of a desired substitute, Contractor must submit catalog cuts of the substituted materials to the Architect 10 calendar days in advance of the bid date (or specified otherwise in accordance with "Instructions to Bidders" to allow ample time for consideration. A decision will be rendered and an addendum will be issued to all Contractors listing any "acceptable substitutes".

B. No substitutions shall be made without approval. The words “approved equal” and “equal” shall mean equal in all respects in the opinion of the Professional.

C. The Electrical Contractor shall furnish, for review by the Professional, all samples specified or called for by the Professional. Finished work shall match approved samples and shop drawings.

D. When shop drawings are submitted on equipment different from the equipment specified hereinafter, this Contractor shall relate each item of the submitted equipment to its specified equivalent.

E. All costs involved in changes in the building, to the equipment, to the arrangement of equipment, or to the work performed due to the substitution of equipment (in lieu of that shown on the drawings or specified), shall be borne by this Contractor making such substitutions and shall include but not necessarily be limited to, costs or fees in connection with resubmission of drawings for approval, if required, by the Commonwealth of Pennsylvania, local authorities or insuring agencies or insuring agencies having jurisdiction over the work.

1.13 QUALITYOF WORKMANSHIP

A. All work shall be installed in a first class, neat and workmanship shall be subject to the approval of the Professional. Any work found by the Professional to be of inferior quality and/or workmanship shall be replaced and/or reworked until approval of the Professional is obtained. Any cost involved in obtaining said approval shall be the responsibility of the Electrical Contractor.

1.14 PERFORMANCE OF EQUIPMENT

A. All materials, equipment and appurtenances of any kind, shown on the drawings, hereinafter specified or required for the completion of the work in accordance with the intent of these specifications, shall be completely satisfactory and acceptable in operation, performance and capacity. No approval, either written or verbal, of any drawings, equipment and/or appurtenances, shall relieve the Electrical Contractor of his responsibility to turn over the same to the Owner in perfect working order at the completion of the work.

B. Any material, equipment or appurtenances, the operation capacity performance of which does not comply with the drawings and/or specification requirements, or which is not new, or which is damaged prior to acceptance by the Owner, will be held to be defective material and shall be removed and replaced with proper acceptable materials, equipment and/or appurtenance or put in proper acceptable working order, satisfactory to the Professional without additional cost to the Owner.

C. All details of the installation of all equipment shall be electrically and mechanically correct. All equipment shall operate without objectionable noise or vibration as determined by the Architect and Owner. If objectionable noise or vibration is produced and transmitted to occupied portions of the building by apparatus, conduit or other parts of a system, any corrections to eliminate noise and vibration shall be made without cost to the Owner.

1.15 TEMPORARY FACILITIES

A. Electrical Contractor shall furnish, install, connect and maintain temporary electrical services to the building until new, permanent services are installed. Complete installation and maintenance of temporary services shall meet all NEC and OSHA requirements.

1.16 METHODS AND MATERIALS

A. The Electrical Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the drawings. Outlets, equipment or wiring improperly placed because of the Electrical Contractor's failure to obtain this information shall be relocated and reinstalled by the Electrical Contractor without additional expenses to the Owner.

B. Each Contractor, upon request of the Architect shall expedite the work of a specific area, section or part of the project to make provision for, or protect equipment or to permit the installation of another part of the work.

C. All materials and equipment supplied by this Contractor shall be new, of the best of their respective kinds, without imperfections and blemishes and shall be protected from the elements prior to installation in the building.

D. All conduits, wire, cable, wiring devices and equipment shall be installed in such a manner as to preserve access to any existing equipment or to any new equipment installed under this specification or under other specifications or contracts for this building and with sufficient space provided for proper operation and maintenance.

E. The drawings are generally indicative of the work to be installed but do not indicate all bends, fittings, boxes, etc., which may be required. Contractor shall carefully investigate the structure and finish conditions affecting his work, arrange his work accordingly and furnish such fittings as may be required to meet such conditions.

F. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building construction where required.

G. All items of labor, material and equipment not specified in detail or shown on the drawings but incidental to or necessary for the complete and proper installation and proper operation of the several branches of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the specifications or drawings.

H. Major items of equipment shall be the best grade and quality used for the purpose in commercial practice and shall have the Manufacturer's name, address and catalog number on a plate securely affixed in a prominent place. All electrical equipment or apparatus of any 1 system must be the product of 1 Manufacturer, or equivalent products of a number of Manufacturers, which are suitable for use in a unified system.

I. When available, all materials and equipment shall bear the label of approval of the Underwriters' Laboratory, Inc.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include 2 for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

3.6 SCAFFOLDING

A. The Electrical Contractor shall furnish and erect all scaffolding and ladders required for the installation of wiring, equipment, and fixtures.

3.7 CLEAN-UP

A. Upon completion of the electrical work and when directed by the Architect, this Contractor shall remove all dirt, foreign materials, stains, fingerprints, etc., from all lighting fixtures, panels, plates, etc., installed under this project and shall leave the electrical work in such a condition that no cleaning by the Owner is required. Internal areas of all equipment must be cleaned of all construction dust, etc., prior to pre-final and/or final inspection.

3.8 PROTECTION OF FACILITIES AND EQUIPMENT

A. The Contractor shall, at his own expense, repair, replace and maintain in service any utilities, facilities or services (underground, over ground, interior or exterior) damaged, broken or otherwise rendered inoperative during the course of construction by him or his representatives. The method used by the Contractor in repairing, replacing or maintaining the services shall be approved by the Architect.

B. Any damage caused by neglect on the part of this Contractor or his representatives, either to the existing work or to his work or to the work of any other Contractor shall be repaired at his expense to the Architect's satisfaction

C. This Contractor shall effectually protect at his own expense all existing facilities and such of his new work, materials or equipment subject to damage during the construction period. All openings into any part of the conduit system as well as all associated fixtures, equipment, etc., both before and after being set in place must be securely covered or otherwise protected to prevent damage from welding, cutting, burning, soldering or similar construction functions, obstruction, damage or injury due to carelessly or maliciously dropped tools or materials, grit, dirt, moisture, water or any foreign matter. This Contractor shall be held responsible for all damage so done, until his work is fully accepted by the Architect. Conduit ends shall be covered with capped bushings.

END OF SECTION 26 0510

SECTION 26 0519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN, XHHW, UF, USE, and SO.

C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC, metal-clad cable, Type MC, mineral-insulated, metal-sheathed cable, Type MI, nonmetallic-sheathed cable, Type NM, Type SO, and Type USE with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. American Insulated Wire Corporation.
7. General Cable Corporation.
8. Southwire Company.
9. Rome Cable Corporation.
10. Pirelli Cable Corporation.
11. Cerro Wire and Cable Corporation

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.4 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.

3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Value Engineering: EC shall provide the Aluminum equivalent for all Copper feeders above 200A, EC shall be responsible for sizing the equivalent Aluminum feeders for all Copper feeders specified throughout the design drawings. The EC shall upsize all conduits where required to accommodate the larger Aluminum feeders.

3.3 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exterior Locations: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders and Branch Circuits - including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

C. Concealed Feeders and Branch Circuits - in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Concealed Feeders and Branch Circuits - in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway. Underground, Type UF multi-conductor feeder cable permitted only where specifically indicated on Drawings.

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

F. Class 1 and 2 Control Circuits: Type THHN-THWN, in raceway.

G. Above Readily Accessible Ceilings: Type THHN-THWN, single conductors in raceway.

H. Motors, Transformers, Recessed Lighting Fixture Connections: Type THHN-THWN, single conductors in flexible metallic conduit.

I. Mineral insulated metal sheath cable, Type MI shall be installed only where indicated on the Drawings.

J. Metal Clad Cable, Type MC shall be installed only where indicated on the Drawings.

K. Metal Clad Cable, Type MC is NOT considered a raceway as defined by Article 100, of the 2008 N.E.C.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Pull all conductors into raceway at same time.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible. Protect exposed cables from damage.

E. Support cables according to Division 26 Section "Hangers and Supports." Do not rest cables on ceiling panels. Utilize spring metal clips or plastic cable ties to support cables from structure.

F. Identify and color-code conductors and cables according to Division 26 Section "Electrical Identification."

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

2. Conductors shall be continuous from outlet to outlet. Splices shall be made only within outlet or junction boxes.

I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

J. General purpose branch circuit wiring may be trunked to the extent of 3 different phases and 1 neutral per conduit, maximum. Connect each circuit in a group of circuits (having a common neutral wire) to opposite phases.

K. Branch circuit wiring designated for computer use or that feeds surge suppression receptacles shall not be trunked. Utilize one neutral per phase leg.

L. Install hospital grade wiring/cable in all health care facilities per Article 517 of the NEC.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both wall surfaces.

E. Extend sleeves installed in floors 2 inches above finished floor level.

F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed (or unless seismic criteria requires a different clearance).

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7.

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7.

J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, provide wiring system tests for compliance with requirements.

    a. Wire and cable shall be tested for continuity, freedom from short circuits and grounds and meggered to assure adequate insulation resistance for each conductor.

    b. Comply with requirements in Division 26 Section "Electrical System Tests".

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 0519

SECTION 26 0520 - EXCAVATION AND BACKFILL

GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Excavation and backfill.

1.3 SCOPE

A. The Electrical Contractor shall be responsible for all excavation and backfilling required to install his underground facilities.

B. The Electrical Contractor shall be responsible for missing all retained trees and new and/or existing retained underground service lines such as electric, gas, water service, sanitary and storm water piping.

C. The final location of duct runs shall be determined in the field by the above requirements and as directed.

D. All excavation shall be unclassified.

E. The items of work to be performed shall include, but not be limited to, the clearing and grubbing, removal of trees and stumps, protection of trees to remain, stripping and storage of top soil (to be used in finish grading), removal of underground obstructions, backfilling, filling, fill compaction and rough and finished grading of entire area affected by the Work to be installed under the Contract.

F. Provide all seeding, sodding and planting at all areas disturbed by Work under this Contract.

G. Where adjacent ground surface areas within the project site are disturbed as a result of building operations or storage of materials under this Contract, they shall be cleaned of all debris and restored to original grades and conditions. Disturbed off-site areas shall be similarly treated.

H. Do not damage or disturb any existing monuments, benchmarks or other markers. Provide suitable protection where required before starting Work. Restore any damage to original condition or repair as directed at no additional cost to the Owner.

I. Before starting Work, protect any trees or shrubs shown or designated to be saved by boxing or wire fencing staked securely in place or other approved means.

J. Existing utility piping or conduit encountered shall be temporarily supported and maintained until permanent support is restored. Piping or conduit to be removed shall be cut off and capped outside the limits of excavation.

1.4 REGULATIONS

A. The Contractor shall conform to all requirements of Act 38 (PA One-Call System) prior to commencing any excavation.

B. The Contractor shall notify the Owner prior to commencing any excavation.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 EXCAVATING

A. Trenches shall be dug to uniform width to provide a free working space on each side of the conduit. To the extent practical, trenches shall be graded so that raceways will have a fall of at least 3 inches per 100 feet away from building.

B. The Contractor shall pump out or otherwise remove any water which may be found in the excavation and he shall provide pumping equipment, as necessary, to keep the excavation entirely clear of water while manholes and ducts are being installed or other operations are being performed requiring a dry condition.

C. Excavation for conduit laying shall be conducted in a manner to cause the least interruption to traffic. Where traffic must cross open trenches, the Contractor shall provide suitable bridges. The Contractor shall erect, maintain and, when no longer needed, remove guard rails, fences, warning lights and other protection required for safety of all persons at excavations.

D. Trenches shall be filled with clean earth fill, installed in 6-inch layers and tamped so as to prevent settlement. Care shall be taken to avoid breaking of joints of conduits. All joints shall be individually supported.

E. All materials excavated shall be deposited on the side of trenches and beyond the reach of slides. Excavated material shall not be piled where it will interfere with traffic.

F. The banks of the excavations shall be generally sloped as required to prevent slides or cave-ins. Where rock formations are encountered and the earth and/or rock is stable, the sides may be cut vertically, or nearly so, consistent with normal and safe practice for excavating the material encountered. The Contractor shall provide and maintain sheathing, shoring and bracing as necessary to protect this project, adjacent structures, workers and other personnel. It is also the Contractor's responsibility to remove temporary sheathing, shoring, bracing and protection when no longer required by adjacent conditions and completion of backfill and rough grading as determined and approved by the Professional.

G. Surplus excavated material not required for backfill shall be removed from the building site or distributed on the premises as directed by the Professional.

3.3 BACKFILLING

A. Backfill material shall consist of clean dry earth, clay, fine gravel or sand and shall be free of organic materials and stones larger than 2 inches in any direction or having

sharp edges. Frozen lumps or clods, soggy or wet materials, clumps or other foreign matter shall not be used as backfill.

B. Fill to required levels any subgrades that settle. Any trenches improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and compaction mounded over and smoothed off.

C. Finish grades which are not indicated shall be uniform slopes or levels between points where elevations are noted, or between such noted points and existing grades, without pockets or depressions which might collect surface water.

D. Contractor shall restore the surface of all excavations to their original conditions, including paved or unpaved streets, gutters, shrubbery, fences, walls, sidewalks and sod. Contractor shall furnish all labor and material required.

E. Where excavations go under new or existing paved areas, they shall be backfilled to within eight inches of finished grades. Backfill shall be brought up in approximately 6-inch layers and compacted. After compacting backfill to the grade as indicated, 4 inches of satisfactory limestone ballast shall be installed and compacted so that paving of the area can proceed immediately by this Contractor. Restoration of concrete or black top highways shall be in accordance with Specifications of the Pennsylvania Department of Transportation.

3.4 WARNING TAPE

A. Marking tape shall consist of a red 3-inch-wide multi-ply, bonded copolymer film formulated for prolonged use underground. It shall be resistant to alkalis, acids and other destructive agents commonly found in the soil. Tape shall have a minimum thickness of 6 mils, minimum tensile strength of 80 pounds per 3-inch width strip, and a minimum elongation of 800 percent. Tape shall bear a continuous printed message normally repeated every 16 to 36 inches.

END OF SECTION 26 0520

SECTION 26 0526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: rods of iron or steel minimum size - 5/8” diameter by 8 feet; rods of pipe or conduit minimum size - 3/4 inch diameter by 10 feet. The Manufacturer and rod length shall be stamped in the surface near the rod top.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

G. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 6 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods (grounding counterpoise) spaced at least 10 feet from each other and located at least the same distance from other grounding electrodes. Interconnect rods with a Number 4/0 copper ground wire and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 2 Section "Underground Ducts and Utility Structures," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.
5. Maximum Grounding System Resistance: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.
3. Painting.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 SUBMITTALS

A. Product Data: For steel slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
      h. Kindorf, Midland Ross
      i. Power-Strut Division; Van Huffel Tube COrporation.

   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
      5) Ackerman Johnson Fastening Systems, Inc.
      6) Ideal Industries, Inc.
      7) Joslyn Manufacturing and Supply Company.
      8) McGraw Edison Company.
      9) Rawlplug Company, Inc.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70 or as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps and single-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.3 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction

boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

F. Do not drill structural steel members.

3.4 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.5 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.7 FINISHING ELECTRICAL EQUIPMENT

A. Prime and paint exposed conduit, boxes, hangers, brackets, collars and supports.

B. Paint exposed conduit and electrical equipment occurring in finished areas.

C. Paint both sides of plywood backboards for electrical and telephone equipment before installing equipment.

END OF SECTION 26 0529

SECTION 26 0530 CONCRETE

PART 1 GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Concrete.

1.3 SCOPE

A. This Contractor shall provide all concrete for his equipment as called for herein and as required for his phase of the work.

1.4 REGULATIONS

A. All work associated with the handling, placing and curing shall conform to current specifications of the American Concrete Institute.

PART 2 PRODUCTS

2.1 CONCRETE

A. All concrete installed above ground on this project by this Contractor shall be of the proportions known as 4000 pounds.

B. All concrete installed below ground shall be of the proportions known as 3000 pounds.

C. All concrete shall be obtained from a local commercial supplier. No strength test shall be required. However, Contractor shall submit concrete mix plant match slip to the Professional.

D. All concrete shall be 6 percent (+/- 1 percent) air entrained and the slump of concrete shall not exceed 3 inches.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 COMPACTION

A. All concrete shall be thoroughly compacted by the use of mechanical vibrators.

3.3 CURING AND PROTECTION

A. To insure adequate curing, do not remove forms from vertical surfaces for 5 days after casting unless other approved means are taken to prevent premature drying of the concrete. Keep all horizontal surfaces continuously wet for 7 days with mechanical sprinklers or coat with an impervious sealer, applied in atomized form at a rate of not less than 1 gallon per 250 square feet after surface water has entirely disappeared, but while surfaces are still moist. This compound shall form an effective seal which will prevent evaporation of moisture from concrete for the full curing period and shall be used in strict accordance with the manufacturer's published recommendations.

B. Provide adequate equipment for heating the concrete and protecting the concrete during freezing or near freezing weather. All concrete materials, reinforcement, forms, fillers and ground with which the concrete will come in contact shall be free from frost.

C. After the first frost and until the mean daily temperature at the site falls below 40 degrees Fahrenheit for more than 1 day, protect concrete from freezing for not less than the first 48 hours after it is placed. When the mean daily temperature falls below 40 degrees Fahrenheit for more than 1 day, place concrete thereafter at a temperature not lower than 55 degrees Fahrenheit and not higher than 70 degrees Fahrenheit and maintained not lower than 55 degrees Fahrenheit for at least the first 3 days. During the next 3 days protect from freezing. When the mean daily temperatures rise above 40 degrees Fahrenheit for more than 3 successive days, placement and maintenance of concrete for 3 days at or above required minimum temperatures may be discontinued, but concrete should not be exposed to freezing temperatures for at least 48 hours after placing.

END OF SECTION 26 0530

SECTION 26 0533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Raceways (conduit) and fittings.
   2. Wireways.
   3. Surface raceways.
   4. Pull, junction, and outlet boxes, enclosures, and cabinets.
   5. Conduit location requirements.

B. See Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks and manholes, and underground handholes, boxes, and utility construction.

1.3 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1 – minimum size ¾”, maximum size 6”.

B. Intermediate Metal Conduit (IMC): ANSI C80.6 – minimum size ¾", maximum size 4".

C. Electrical Metallic Tubing (EMT): ANSI C80.3 – minimum size ¾", maximum size 4".

D. Flexible Metal Conduit (FMC): Zinc-coated steel – sized to comply with 2005 N.E.C. Article 348.20.
   1. Transformer Connections: 42" maximum length, same size as conduit to which it is connected.

   2. Motor Connections: 18" maximum length, same size as conduit to which it is connected.

   3. Lighting Fixture Connections: 72" maximum length, 3/8" minimum.

E. Liquidtight Flexible Metal Conduit (LFMC): Flexible (interlocked) steel conduit with PVC jacket – minimum size ¾", maximum size 4".

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: ANSI/NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
   2. Fittings for EMT: Steel, set-screw type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Rigid non-metallic conduit (RNC): NEMA TC 2, Schedule 40 PVC, unless otherwise indicated.

B. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Cooper B-Line, Inc.
   2. Hoffman.
   3. Square D; Schneider Electric.
   4. Wiremold/Walker

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 (indoor general purpose) or Type 3R (outdoor- rain tight), unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Metal Floor Boxes: Cast or sheet metal, fully adjustable rectangular. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.

I. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 CONDUIT LOCATION REQUIREMENTS

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit EMT.
3. Underground Conduit: RNC, Type EPC-40 -PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.3 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 12 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Do not cross conduits in slab.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

K. Raceways for Optical Fiber and Communications Cable: Install as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F , and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

N. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations and locations subject to severe physical damage.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7.

END OF SECTION 26 0533

SECTION 26 0550 - ELECTRICAL SYSTEM TESTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

A. Field acceptance and operational testing of all electrical equipment and systems.

1.3 QUALITY ASSURANCE

A. Test materials and methods shall conform to all applicable codes, the requirements of authorities having jurisdiction and the latest edition of reference standards published by the organizations listed in Section 260510 applicable to the work of this section.

B. Test instrument calibration in accordance with NETA ATS.

1.4 GENERAL REQUIREMENTS FOR TESTING

A. Retesting required as a result of malfunction or failure of equipment to meet specified performance criteria shall be performed at no additional cost to the Owner.

B. Where possible, malfunctioning equipment shall be corrected at the site and retested; otherwise, equipment shall be replaced with new equipment and retesting shall proceed.

C. Upon satisfactory completion of these tests, the Contractor shall furnish, for each item of equipment or system tested, a written statement certifying that there has been no invalidation of any warranties or impairment of the capacity or functionality of the equipment or system tested.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide all equipment required to conduct tests as specified herein, including any specialized test equipment recommended by a system manufacturer.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 SCHEDULING

A. Notify the Professional two weeks prior to testing. Scheduling of all tests shall be approved by the Professional.

B. Schedule tests so as not to interfere with the overall progress of the job.

C. Schedule tests so that equipment may be energized immediately after completion of testing and approval of reports.

3.3 PREPARATION

A. Examine the Contract Documents to ensure the completeness of all Work prior to testing.

B. Megger and high potential testing shall not be performed during periods of high relative humidity. A guard shall be stationed at each location where exposed cables, buswork, connections or other components exist during megger and high potential testing.

C. All equipment shall be thoroughly cleaned prior to testing. Vacuum the interiors of all cabinets and equipment cubicles and remove all foreign material. Wipe all insulators, bushings and bus supports clean with a lint free cloth.

D. Preliminary tests and visual inspections of the electrical installation including verification checks of factory wiring shall be conducted prior to electrical acceptance and operational tests to avoid delays, and to assure that equipment and installations are free of faulty conditions prior to the application of test voltages.

E. Where the equipment or system under test is interconnected with or dependent upon other equipment, systems and/or controls for proper operation, the latter shall be operated simultaneously with the equipment or system under test to verify proper functioning of all interfaces.

F. Verify that all shipping materials and restraints have been removed from equipment.

G. Check for proper tightness at all connections of shipping sections.

3.4 WIRING SYSTEM TESTS (600 VOLTS AND LESS)

A. Wire and cable shall be tested for continuity, freedom from short circuits and grounds and meggered to assure adequate insulation resistance for each conductor.

B. Megger instrument shall apply 1000 volts DC for 1 minute.

C. Insulation resistance between any 2 phase conductors and any phase conductor to ground shall be not less than 2 meggohms for connected conductors and 100 megaohms for disconnected conductors.

D. Submit schedule of test results for all feeders rated at 100 amps or greater. Schedule shall indicate feeder designation, load served, feeder size, feeder length and measured values for each conductor. Individual values shall be recorded for each conductor of multiple phase circuits.

E. Visual and Maintenance Inspection:

1. Inspect each individual exposed power cable number 6 AWG and large for:

a. Physical damage.

b. Proper connections in accordance with single line diagram.

c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.

d. Color-coding conformance with specifications.

e. Proper circuit identification.

2. Mechanical Connections for:

a. Proper lug type for conductor material.

b. Proper lug installation.

c. Bolt torque level in accordance with NETA ATS, Table 10.1, unless otherwise specified by Manufacturer.

3. Shielded Instrumentation Cables for:

a. Proper shield grounding.

b. Proper terminations.

c. Proper circuit identification.

4. Control Cables for:

a. Proper termination.

b. Proper circuit identification.

3.5 GROUNDING SYSTEM TESTS

A. Tests on the grounding system shall be made after complete installation and interconnection of the ground system elements including individual ground rods, ground counterpoise or grid cables, connections to structural steel, reinforcing bars, incoming water piping, ground busses on walls and within equipment, etc.

B. Test the grounding system for continuity by applying a low voltage DC source of current, capable of providing up to 100 amperes. The ground path using structural steel must conduct 100 amperes. Resistance as calculated from the current and voltage shall not exceed 0.25 ohms.

C. Test the completed equipment grounding system at each distribution panel, motor control center and branch circuit panelboard. Ground resistance shall not exceed 5 ohms at any piece of distribution equipment and 10 ohms at any item of utilization equipment. Ground resistance tests at distribution equipment shall be made in

accordance with the procedures described in James G. Biddle Company Bulletins 25-T2 and 25-J and in accordance with IEEE 81, Section 8.2.1.1 and 8.2.1.5.

D. Visual and Mechanical Inspection:

1. Equipment and circuit grounds in panelboard assemblies for proper connection and tightness.

2. Effective transformer care and equipment grounding.

3. Accessible connections to grounding electrodes for proper fit and tightness.

3.6 DISTRIBUTION EQUIPMENT TESTS

A. All distribution equipment shall be tested for continuity, freedom from short circuits and grounds and meggered to assure adequate resistances.

B. Megger instrument shall apply 1000 volts DC for equipment rated 480 or 600 volts and 500 volts DC for equipment rated 250 volts; applied for 1 minute.

C. Insulation resistance between any 2 phases and any phase to ground shall be not less than 100 megohms for equipment rated 480 or 600 volts and 25 megohms for equipment rated 250 volts.

D. Measure load current on each phase of panelboards serving single phase loads. Rearrange branch circuits to balance phases to within +/-10 percent of the average load. Maintain proper phasing of trunked branch circuit homeruns.

E. Perform an insulation resistance test at 1000 volts DC on each circuit breaker for 1 minute from pole-to-pole and from pole-to-ground with the breaker closed and across open contacts of each phase. Insulation resistance shall not be less than 100 megaohms.

F. Set, calibrate and adjust protective device settings of each circuit breaker in accordance with the approved coordination study using secondary current injection.

G. Verify proper wiring and polarity of all ground fault protection devices. Verify proper operation and performance of zone-selective interlocking schemes by simulating a ground fault condition.

3.7 ELECTRICAL ACCEPTANCE TESTS

A. The Contractor shall engage the services of a recognized independent testing agency to perform certain electrical tests as herein specified. The testing agency shall be responsible to do the specified electrical tests in total compliance with the specification of the National Electrical Testing Association (NETA). The Electrical Contractor shall be responsible to do visual and mechanical inspections as well as megger tests as detailed herein and in total compliance with the specifications of NETA. The Electrical Contractor shall certify in writing that the visual and mechanical inspections were completed and the results of those inspections.

B. The testing agency shall provide all material, equipment, labor and supervision required to conduct the electrical tests.

C. It is the intent of these inspections and tests to determine the suitability for reliable operation of certain electrical facilities and upon completion, a label shall be attached to all items included in this scope of work. These labels shall indicate the date of tests and the agency responsible for conducting the tests.

D. As copyrighted by NETA, the responsibility of the testing laboratory and the Contractor shall be as follows:

1. The Contractor shall perform routine resistance, continuity and rotation tests for main distribution and utilization equipment prior and in addition to tests performed by the testing agency specified herein. The Contractor shall also perform the specified visual and mechanical inspections.
2. The Contractor shall supply a suitable and stable source of test power to the test laboratory at each test site. The testing agency shall specify requirements.
3. The Contractor shall notify the testing agency when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.
4. The Contractor will supply a complete set of electrical plans, specifications and any pertinent change orders to the testing agency prior to commencement of testing.
5. The testing agency shall notify the Professional prior to commencement of any testing.
6. Any system, material or workmanship which is found defective on the basis of acceptance tests shall be reported directly to the Professional.
7. The testing agency shall maintain a written record of all tests and upon completion of project, assemble and certify a final test report.

E. Test Instrument Traceability:

1. The testing agency shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.
2. The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain.
3. Instruments shall be calibrated in accordance with the following frequency schedule:
    a. Field instruments - 6 months maximum.
    b. Laboratory instruments - 12 months.
    c. Leased specialty equipment - 12 months (where accuracy is guaranteed by lessor, i.e. Doble).
4. Date calibration labels shall be visible on al test equipment.
5. Records must be kept up-to-date which show date and results of all instruments calibrated or tested.
6. An up-to-date instrument calibration instruction and procedure will be maintained for each test instrument.

F. Test Report:

1. The test report shall include the following:
    a. Summary of project.
    b. Description of equipment tested.

c. Description of test.

d. Test results.

e. Conclusions and recommendations.

f. Appendix, including appropriate test forms.

g. List of test equipment used and calibration date.

2. Furnish 3 copies of the completed report to the Professional no later than 30 days after completion of the tests.

G. Applicable Codes, Standards and References:

1. All inspection and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

a. National Electrical Code - NEC.

b. National Electrical Manufacturer's Association - NEMA.

c. American Society for Testing and Materials - ASTM.

d. Institute of Electrical and Electronic Engineers - IEEE.

e. National Electrical Testing Association - NETA.

f. American National Standards Institute - ANSI.

g. State and Local Codes and Ordinances.

h. Insulated Power Cable Engineers Association - IPCEA.

i. Association of Edison Illuminating Companies - AEIC.

j. OSHA Part 1910; Subpart S, 1910.308.

k. National Fire Protection Association - NFPA.

2. All devices and materials to perform the tests must be obtained prior to commencing the work.

a. All instruments must be available and in proper operating condition.

b. All dispensable materials such as solvents, rags and brushes required must be provided.

c. All equipment handling devices such as vehicles, chain falls and other lifting equipment must be available or scheduled.

d. All instruction books, calibration curves or other printed material to cover the electrical devices must be available.

e. Data sheets to record all rest results must be available before the work is started.

3. All inspections and tests shall utilize the following references:

a. Project design specifications.

b. Project design drawings.

c. Manufacturer's instruction manuals applicable to each particular apparatus.

H. Safety and Precautions:

1. Safety practices shall include, but are not limited to, the following requirements:
    a. Occupational Safety and Health Act of 1970 - OSHA.
    b. Accident Prevention Manual for Industrial Operations, Seventh Addition, National Safety Council, Chapter 4.
    c. Applicable State and Local Safety Operating Procedures.
    d. NETA Safety/Accident Prevention Program.
    e. Owner's Safety Practices.
    f. National Fire Protection Association - NFPA 70E.
2. All tests shall be performed with apparatus de-energized except where otherwise specifically required by NETA.
    a. Field coordinate shut-down with Owner to minimize interruption to their normal operations.
3. The testing agency shall have a designated safety representative who shall be present on the project and supervise operations with respect to safety.
4. Power circuits shall have conductors shorted to ground by a hot-line grounded device approved for the purpose.
5. In all cases, work shall not proceed until the safety representative has determined that it is safe to do so.
6. The testing agency shall have available sufficient protective barriers and warning signs to conduct specified tests safely.

3.8 FAULT PROTECTION AND COORDINATION STUDY

A. The complete coordination study for system protection to be performed by the testing company as specified herein before in this Section. Fault current calculations to be provided for the entire system.
    1. The fault protection and coordination study shall include the following information:
        a. Calculated available fault currents at all equipment busses and overcurrent protective devices in the system. Values shall be calculated for 3 phase bolted fault conditions. The current limiting effects of fuses shall be demonstrated in the report.
        b. Complete sets of time-current coordination curves, starting with devices at the point of service through to the branch devices in each item of equipment at the lowest levels of the distribution system.
        c. A complete set of motor starting time-current curves for motors exceeding 50 horsepower based on the Wk^2 inertia of the driven load.
        d. A complete set of transformer inrush and thermal withstand curves.
        e. A tabulation of all recommended relay settings including ground fault relay settings, fuse sizes and classes and circuit breaker trip settings; identifying each item by Manufacturer and catalog number.

f. A tabulation of any cases where selective coordination is not obtainable and a description of the consequences of a downstream fault on continuity of service.

g. The study shall also include any related data required for substation and clarification of the main content of the report.

3.9 IMPLEMENTATION OF RECOMMENDATIONS

A. Upon approval of the final study by the testing company, the Contractor shall adjust protective device settings for new and existing protective devices in the affected equipment in accordance with the values recommended in the report.

B. The final selection of protective devices for all new equipment furnished under this Contract shall be based on the approved study.

END OF SECTION 26 0550

SECTION 26 0551- ARC FLASH

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide an Arc Flash Hazard Study for the electrical distribution system shown on the one line drawings. The intent of the Arc Flash Hazard Study is to determine hazards that exist at each major piece of electrical equipment shown on the one line drawing . This includes switchgear, switchboards, panelboards, motor control centers, paralleling gear, and transformers. The proposal shall state the total number of arc flash labels (locations with calculations) that will be supplied. The study will include creation of Arc Flash Hazard Warning Labels listing all items as shown on the sample label below. These labels serve as a guide to assist technicians and others in the selection of proper Personal Protective Equipment when working around exposed and energized conductors. The electrical contractor will install the labels.

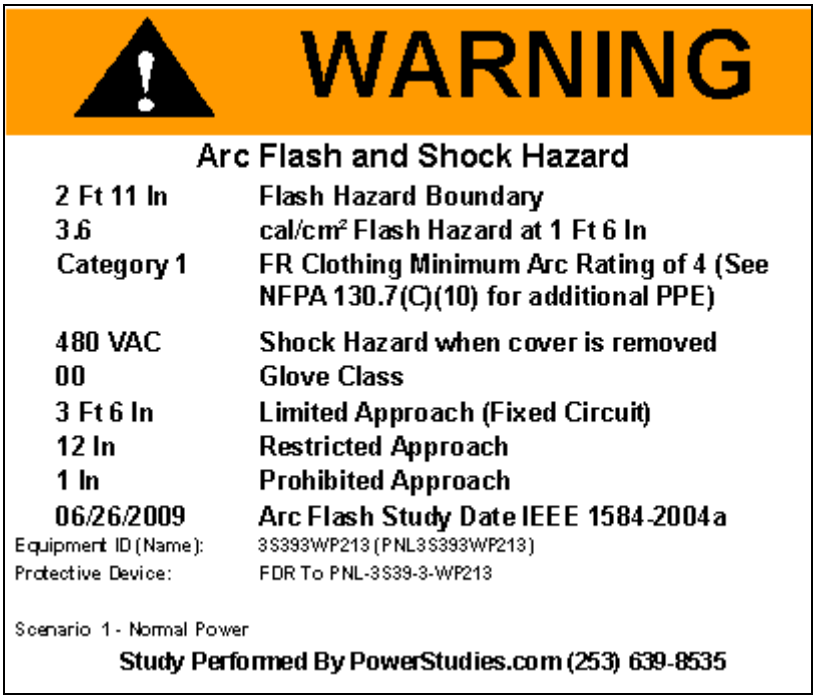

Figure 1 – Example Arc Flash Label

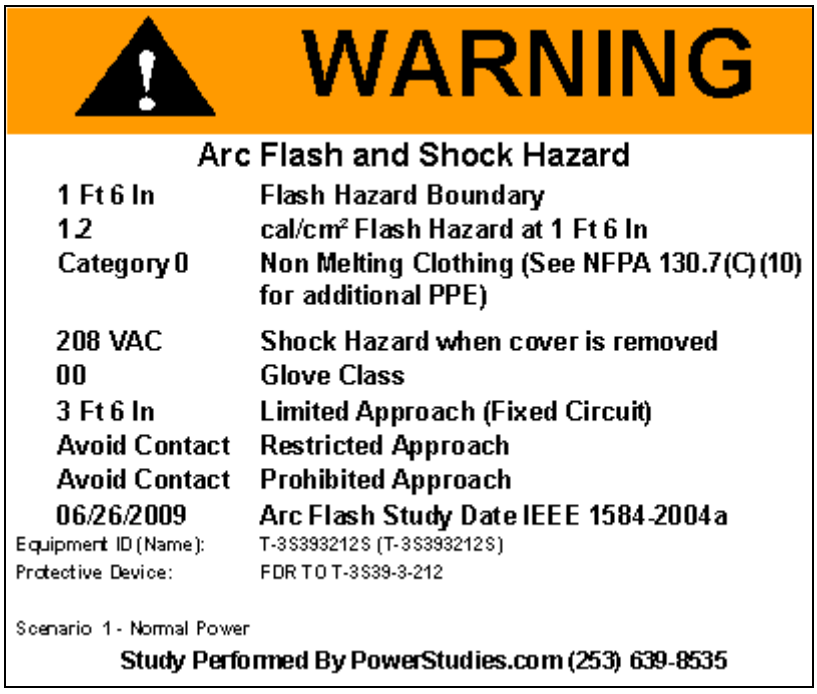

Figure 2 – Example Arc Flash Label for 240 & 208 Volt Areas served by less than 125 kVA Transformers

B. The arc flash hazard study shall include the electrical distribution system equipment shown on the one line drawing down to and including all equipment fed by transformers rated 125 kVA and below. Equipment fed by transformers rated 125 kVA or less with a secondary voltage of 240 V or less, is considered to be Hazard Risk Category 0 (see Figure 2) by NFPA 70E.

C. Utilize an up-to-date current short-circuit and protective device coordination study while performing the Arc Flash Hazard Study. Use of NFPA 70E Task tables is not allowed to determine AF Hazard Category.

D. The arc flash hazard study shall consider all operating scenarios during normal conditions alternate operations, emergency power conditions, and any other operations, which could result in maximum arc flash hazard. The label shall list the maximum incidental energy calculated and the Scenario number and description on the label. The following is a list of the known operating scenarios:
   1. Normal Utility Power and Steam Turbine Generator Power
   2. Parallel Emergency Generator Power
   3. Portable Emergency Generator Power

E. Existing Equipment Data will be provided by the owner or can be obtained through a field survey if not supplied by the owner.

F. The independent consultant performing the study will provide Equipment data sheets for the electrical contractor to complete and /or the electrical equipment database to the electrical contractor to enter data.

G. An Equipment Database shall be provided to the owner at the completion of the study. The database shall contain and list all electrical equipment used in the study and the results of the arc flash study. This equipment database shall be a Microsoft ACCESS Database. The data base shall have the minimum features and functions:

1. Equipment Nameplate Data and Protective Device Settings for the following equipment shown in the table below. The database shall also have equipment database report listing the data below for each piece of equipment.

Parallel Gear	Control Panels	Disconnect Switches
Circuit Breakers	Fuses	Generators
Motor Control Centers	Motor Starters	Motors > 50 HP
Bus Duct Runs	Panelboards	PDUs
Relays	Switchboards	Switchgear
Transformers	UPS	VSD
Conductor	Other Equipment	Utility Data

The equipment nameplate data shall include a minimum of the following information:

Manufacturer	Type	Voltage
Amperage	kVA	HP
Size (conductor)	Length (conductor)	# per Phase (conductor)
RLA (motor)	LRA (motor)	NEMA Code (motor)
Frame Size	Trip	Sensor
Breaker & Relay Settings	Impedance (generators & transformers)	Winding Connections (Transformers)
Temperature Ratings	Short Circuit Rating	Withstand Rating
Date of Manufacture	Weight (transformers)	Catalog Number
Serial Number		

2. Library with conductor, transformer, fuse, relay, and circuit breaker data.

3. Short Circuit Study results importation from SKM program for all operating scenarios.

4. Arc Flash Study results importation from SKM program for all operating scenarios.

5. The database shall produce the following reports:

Low Voltage Equipment Short Circuit Summary Sheet	Medium Voltage Equipment Short Circuit Summary Sheet	Arc Flash Energy Report (All Scenarios)
Arc Flash Energy	Arc Flash Labels	Arc Flash Labels

Report (Maximum Energy)	(All Scenarios)	(Maximum Energy)
Equipment Nameplate Data and settings Report	Discussion of TCCs Report	Missing Transformer Data Report
Missing Motor Data Report	Missing Conductor Data Report	Missing Connections Report

6. Ability to print Arc Flash labels from the database.

7. Protective Device sizes and settings

H. The owner's electrical contractor will install the arc flash labels. .

I. The proposal for this study must state the following items

1. Number of arc flash labels (locations) that will vendor will be produce.
2. Number of operating scenarios to be included in the study.
3. Who will collect the existing equipment data
4. Who will be installing the labels.
5. Any exceptions to the specifications and reqirements shall be clearly stated in the proposal.
6. Terms and Conditions
7. Estimated data collection time
8. Estimated completion date.

1.2 QUALIFICATIONS

A. The Contractor shall have the study prepared by qualified engineers of an independent consultant. The consultant shall be a Registered Professional Electrical Engineer (licensed in New York state where the project is completed) who has at least ten (10) years of experience and specializes in performing power system studies.

B. The arc flash hazard study shall be performed using SKM PowerTools for Windows or an equivalent computer software package. Using NFPA 70E Task Tables to determine Hazard Classification is not acceptable.

1.3 SUBMITTALS

A. The contractor or consulting firm shall submit a draft report for review by the owner before printing the arc flash hazard labels. The draft report shall contain paper copies of the proposed labels.
B. The contractor or consulting firm shall submit the final arc flash hazard study and arc flash warning labels at least 30 days prior to energizing the electrical equipment.
C. Submit three (3) copies of the study and (1) set of warning labels.

PART 2 - EXECUTION

2.1 CONSTRUCTION WASTE MANAGEMENT

1. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

2.2 ARC FLASH HAZARD STUDY

A. Perform the arc flash hazard study after the short circuit and protective device coordination study has been completed.

B. The study shall be calculated by means of the SKM PowerTools for Windows computer software package or approved equal. Pertinent data, rationale employed, and assumptions in developing the calculations shall be incorporated in the introductory remarks of the study.

C. The study shall be in accordance with latest applicable NFPA 70E, OSHA 29-CFR, Part 1910 Sub part S, IEEE 1584, and NESC Standards. The study must be performed using IEEE 1584 for equipment rated 50 to 15 kV and NESC for equipment rated above 15 kV.

D. Determine the items shown on the example labels (figure 1 & 2) at each location shown on the one line drawing.

E. Produce an Arc Flash Warning label as shown above in Figures 1 & 2.. Also include the bus name and voltage. Labels shall be printed in color and shall be moisture proof, adhesive backed. Labels for outdoor equipment shall be vinyl and UV resistant to avoid fading.

F. Produce three Arc Flash Evaluation Summary Sheet reports. The first shall list the items below for the maximum calculated energy levels. The second report shall list all incident energy values at each location for each scenario. The third report shall list all "Dangerous" locations (using maximum calculated energy levels) where the incident energy level is 40 Cals/cm2 (Above Hazard Risk Category 4). The reports shall list the following items:

1. Bus Name

2. Scenario

3. Upstream Protective Device Name, Type, and Settings

4. Bus Line to Line Voltage

5. Bus Bolted Fault

6. Protective Device Bolted Fault Current

7. Arcing Fault Current

8. Protective Device Trip / Delay Time

9. Breaker Opening Time

10. Solidly Grounded Column

11. Equipment Type

12. Gap

13. Arc Flash Boundary

14. Working Distance

15. Incident Energy

16. Hazard Risk Category

PART 3 - ANALYSIS

Analyze the arc flash calculations and highlight any equipment that is determined to be underrated or causes an abnormally high incident energy calculation. Propose general methods and approaches to reduce the energy levels. Proposed major corrective modifications will be taken under advisement by the Engineer, and the Contractor will be given further instructions.

PART 4 - REPORT

The results of the power system study shall be summarized in a final report. The report shall include the following sections:

A. Introduction, executive summary and recommendations, assumptions, reduced copy of the one line drawings.

B. Arc Flash Evaluations Summary Spreadsheet (Maximum Energy Calculation)

C. Arc Flash Evaluations Summary Spreadsheet (All Scenarios for each location Energy Calculation)

D. Arc Flash Evaluations Summary Spreadsheet (Dangerous (HRC>4) Locations)

E. Arc Flash Hazard Warning Labels printed in color on paper. Instruction on how to install the labels on the equipment.

F. One set of labels printed in color on moisture proof adhesive backed labels. Labels for outdoor equipment shall be vinyl and UV resistant to avoid fading.

G. Protective Device List

H. SKM or equivalent project data base files.

I. Existing Equipment Database files

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Warning labels and signs.
3. Equipment identification labels.
4. Color coding.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION-AND-CONTROL-CABLE IDENTIFICATION MATERIALS

A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

D. Fasteners for Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
3. High Voltage Equipment Warning: “DANGER – HIGH VOLTAGE”

2.3 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.4 COLOR CODING

A. Conductor Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for service, feeder, and branch-circuit conductors.

1. 120 volt, 2 wire circuit - grounded neutral, white; ungrounded leg, black.

2. 240/120 volt, 3 wire single phase circuit - grounded neutral, white; 1 hot leg, black and the other hot leg, red.

3. 240/120 volt, 3 phase, 4 wire-grounded neutral white; 1 hot leg, black; 1 hot leg, red and high leg orange.

4. 208Y/120 volt, 3 phase, 4 wire - grounded neutral, white; 1 hot leg, black; 1 hot leg red and the other hot leg, blue.

5. 480Y/277 volt, 3 phase, 4 wire - grounded neutral, gray; 1 hot leg, yellow; 1 hot leg brown and the other hot leg, orange.

6. 480 volt, delta, 3 phase, 3 wire - 1 hot leg, yellow; 1 hot leg brown and the other hot leg orange.

7. All 120 volt, 2 wire emergency circuits - grounded neutral, white; ungrounded leg, purple.

8. All 12 volt, 2 wire emergency circuits - grounded leg, white; ungrounded leg, orange with black stripes.

9. All ground wires shall be green.

10. Color shall be factory applied.

11. All conductors shall be marked in accordance with 2008 N.E.C. Article 310.11.

12. Provide conductor identification in accordance with 2008 N.E.C. Article 310.12.

B. Conduit Color-Coding:

1. Primary Distribution: Magenta with white markings no greater than 30 feet on center reading “HIGH VOLTAGE”.

2. 480Y/277V and 208Y/120V Normal Service, natural (not painted).

3. Emergency (and Normal Emergency Service): Yellow.

4. Uninterruptible (UPS) Service: Blue.

5. Fire Alarm System: Red

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 APPLICATION

A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where 2 lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
    c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

    a. Panelboards, electrical cabinets, and enclosures.
    b. Electrical switchgear and switchboards.
    c. Transformers.
    d. Motor-control centers.
    e. Disconnect switches.
    f. Enclosed circuit breakers.
    g. Motor starters.
    h. Push-button stations.
    i. Power transfer equipment.
    j. Contactors.

3.3 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

END OF SECTION 26 0553

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.

B. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Intermatic, Inc.
2. Leviton Mfg. Company Inc.

3. Hubbell.
4. Paragon Electric Co.; Invensys Climate Controls.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. Square D; Schneider Electric.
7. TORK.
8. Watt Stopper (The).

B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Contact Configuration: DPST.
2. Contact Rating: 20-A ballast load, 277V ac.
3. Program: (4) channel, 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
5. Astronomic Time: All channels.
6. Battery Backup: For schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Intermatic, Inc.
2. Lithonia Lighting; Acuity Lighting Group, Inc.
3. Hubbell.
4. Paragon Electric Co.; Invensys Climate Controls.
5. Square D; Schneider Electric.
6. TORK.
7. Watt Stopper (The).

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

C. Description: Solid state, with SPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.

2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.3 INDOOR OCCUPANCY SENSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Watt Stopper or a comparable product by one of the following:

1. Hubbell Lighting.
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. Watt Stopper (The).
5. Lutron

B. Wall Switch Sensors: 2-wire, completely self-contained PIR sensor that fits into a standard single gang box. Compatible with electronic ballasts, compact fluorescent and inductive loads. Rated to switch loads up to 800W @ 120V and 1200W @ 277V. 180° coverage.
1. Model #WA-200 – PIR, 300ft².
2. Model #WA-300 – PIR (dual relay), 300ft².
3. Model #WI-200 – PIR, 1000ft².
4. Model #WI-300 – PIR (dual relay), 1000 ft².

C. Automatic Time Switch: Single-gang, digital time switch compatible with all electronic ballasts and motor loads. Line or low voltage as indicated on drawings. Incremental time-out adjustments 5 min. to 12 hrs. Optional audible and visual warnings.
1. Model #TS-400 – 120V.
2. Model #TS-400-24 – 24V.

D. Ceiling Sensors: 24V DC, passive infrared, ultrasonic or dual technology sensors compatible with electronic ballasts, compact fluorescent and rated motor loads. Ceiling or corner mounted as indicated.
1. Model #WPIR – PIR, 300 ft², ceiling mount.
2. Model #CX-100 – PIR, 2000², wall/ceiling mount.
3. Model #CX-100-1 – PIR, long range, 90 linear ft.
4. Model #W-500A – Ultrasonic, 500 ft².
5. Model #W-1000A – Ultrasonic, 1000 ft².
6. Model #W-2000A - Ultrasonic, 2000 ft².
7. Model #W-2000H – Ultrasonic, long range, 90 linear ft.
8. Model #WT-2255 – Ultrasonic, hallway sensor, 90 linear ft. 360º.
9. Model #DT-200 – Dual, 2000 ft², wall/ceiling mount.
10. Model #DT-300 – Dual, 2000 ft², ceiling mount.

E. Power Packs: Plenum rated, self-contained transformer and high-current relay. 24V DC operating voltage capable of switching 20A ballast load. 1 per circuit or control zone.
1. Model #B120E-P – 120V.
2. Model #B277E-P – 277V.
3. Model #BZ-100 – dual voltage 120/277V.

F. Wall switch sensors shall have no leakage current to load, in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.

G. Wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.

H. Vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0mm thickness. Products utilizing a soft lens will not be considered.

I. Passive infrared sensors shall respond only to those signals caused by human motion.

J. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line), superior performance and optimum reliability.

K. Where specified, passive infrared and dual technology sensors shall offer daylighting foot-candle adjustment control and be able to accommodate dual level lighting.

L. Dual technology sensors shall be corner mounted to avoid detection outside the controlled area when doors are left open.

M. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.

N. Ultrasonic sensors shall adjust the detection threshold dynamically to compensate for constantly changing levels of activity and airflow throughout controlled space.

O. Ultrasonic operating frequency shall be crystal controlled to within $\pm$0.005% tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.

P. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

Q. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

R. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

S. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

T. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

U. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

V. All sensors shall have UL rated, 94V-0 plastic enclosures.

W. CIRCUIT CONTROL HARDWARE – CU

X. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Control unit shall provide power to a minimum of 2 sensors.
   1. Relay Contacts shall have ratings of:
      a. 13A - 120 VAC Tungsten.
      b. 20A - 120 VAC Ballast.
      c. 20A - 277 VAC Ballast.

Y. Control wiring between sensors and controls units shall be Class II, 18-24 AWG, stranded U.L. Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.

Z. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

2.4 INSTALLATION

A. It shall be the contractor's responsibility to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have 90% to 100% coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms, which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room. Power/switch packs may or may not be indicated on the drawings. It shall be the contractor’s responsibility to provide and install all power/switch packs required to make the system fully operational. Locations of power/ switch packs may be determined in the field by the contractor unless specified otherwise, but must be readily accessible for future servicing. Usually, a minimum of 1 power/switch pack is required per circuit and/or area of control. However, in some cases additional power/switch packs may be required. Contact manufacturer for final determination of power/switch packs required for this project.

B. It is the contractor’s responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.

C. Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment and problem solving diagnosis of the occupancy sensing devices and systems.

D. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

2.5 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Electrical Inc.; Cutler-Hammer Products.
4. GE Industrial Systems; Total Lighting Control.
5. Grasslin Controls Corporation; a GE Industrial Systems Company.
6. Hubbell Lighting.
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems.
9. Square D; Schneider Electric.
10. TORK.
11. Touch-Plate, Inc.
12. Watt Stopper (The).

B. Description: Electrically operated and mechanically held, combination type with non-fused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings matching the NEMA type specified for the enclosure.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.3 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Conductors and Cables." Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."

1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 26 0923

SECTION 26 1180 DUCTBANK

PART 1 GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Metal Conduit.

B. Plastic Conduit.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Ductbank

1. Basis of Measurement - By the lineal foot for each configuration.

2. Basis of Payment - Includes purchase, delivery and installation of duct, fittings, supports and accessories, and for trenching, concrete encasement and backfill.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 260510.

B. Accurately record actual locations of exact routing of ductbank.

1.5 PRODUCT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of ductbank prior to excavation for rough-in.

C. Ductbank routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.

PART 2 PRODUCTS

2.1 METAL CONDUIT

A. PVC externally coated rigid steel, 40 millimeters thick: NEMA RN 1.

B. Fittings: ANSI/NEMA FB 1; steel.

2.2 PLASTIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.3 REINFORCING FOR CONCRETE ENCASEMENT

A. Number 5 rods approximately every 8 inches on center on the 4 sides of the envelope and number 4 tie rods every 4 feet with necessary ties.

2.4 WARNING TAPE

A. Detectable warning tape shall be red, 3 inches wide and shall consist of 1 layer of aluminum foil laminated between 2 layers of inert plastic film. It shall be resistant to alkalis, acids and other destructive agents commonly found in the soil. The lamination bond should be strong enough that the layers cannot be separated by hand. Tape shall be a minimum of 4.5 mils. thick with a minimum tensile strength of 60 pounds in the machine direction and 58 pounds in transverse direction per 3 inch wide strip. Tape shall be imprinted with a continuous warning message normally repeated every 16 to 36 inches. It shall be inductively locatable and conductively traceable using a standard pipe and cable locating device.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 EXAMINATION

A. Verify excavation under provisions of Section 16052.

B. Verify that excavation, base material installation and compaction is completed.

3.3 DUCT BANK INSTALLATION

A. Install PVC coated rigid steel within 5 feet of exterior wall and Schedule 40 PVC conduit elsewhere for straight runs.

B. Install duct to locate top a ductbank at depths as indicated on drawings.

C. Install duct with minimum slope of 3 inches per 100 feet. Slope duct away from building entrances.

D. Cut duct square using saw or pipe cutter; de-burr cut ends.

E. Insert duct to shoulder of fittings; fasten securely.

F. Join nonmetallic duct using adhesive as recommended by Manufacturer.

G. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes minimum.

H. Install large radius sweep, 36 inches minimum, PVC externally coated rigid steel ells in ducts.

I. Install no more than equivalent of 3, 90 degree bends between pull points.

J. Provide suitable fittings to accommodate expansion and deflection where required.

K. Stagger duct joints vertically in concrete encasement 6 inches minimum.

L. Use suitable separators and chairs installed not greater than 4 feet on centers. Bond conduits to separators and chairs.

M. Band ducts together before backfilling and placing concrete.

N. Securely anchor duct to prevent movement during concrete placement.

O. Place concrete under provisions of Section 260530.

P. Provide minimum 3 inch concrete cover at bottom, top and sides of ductbank.

Q. Concrete envelopes shall be reinforced at all points where they cross fill or loose soil, foreign piping or under vehicular roadways. Reinforcing shall extend 6 feet beyond each limit of fill, roadway and/or foreign pipe.

R. Connect to existing concrete encasement using dowels.

S. Provide suitable pull string in each empty duct except sleeves and nipples.

T. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

U. Backfill trenches under provisions of Section 260520.

V. Interface installation of underground warning tape with backfilling specified in Section 260520. Install tape 6 inches below finished surface.

W. A minimum separation of 12 inches shall be maintained between telecommunication ductbanks and electrical ductbanks.

3.4 DELIVER, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 260510.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

END OF SECTION 26 1180

SECTION 26 18 00 - EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.2 WORK INCLUDED

A. Electrical connections to equipment specified under other Divisions.

1.3 COORDINATION

A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other Divisions.

B. Determine connection locations and requirements.

C. Sequence rough in of electrical connections to coordinate with installation schedule for equipment.

D. Sequence electrical connections to coordinate with start-up schedule for equipment.

E. Division 26 Contractor shall provide required 120 volt circuits for HVAC controls, fire alarm systems, etc. Coordinate with Division 23 Contractor for specific requirements.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

B. Cord Construction: Oil-resistant thermoset insulated Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

C. Cord Size: Same as rating of branch circuit over-current protection.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.4 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.

C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is required.

E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

F. Install combination starters, disconnect switches, controllers, control stations, and control devices as indicated.

G. Verify proper rotation of three-phase equipment.

H. Extend power wiring, where applicable, through external disconnect switches, combination starter/disconnect switches, thermal switches, local control switches, remote mounted control panels, etc. and connect to terminals in the equipment.

I. Where applicable, extend wire and conduit between control device (start/stop pushbuttons or lighted handle switch) and combination starter/disconnect switches.

J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

3.5 CONTRACTOR RESPONSIBILITIES (MECHANICAL CONTRACT)

A. Gas-Fired Unit Heaters:

1. 120 volt, 1 phase.

2. Thermal overload switch furnished and installed adjacent to unit by Division 26 Contractor.

3. Division 23 Contractor shall provide any other connections and/or equipment required.

B. Roof Fans - Manually Controlled:

1. 120 volt, 1 phase.

2. Integral disconnect switch provided by the equipment Manufacturer.

3. Thermal overload switch, with pilot light furnished and installed by Division 26 Contractor.

4. Where indicated/noted, thermostat, light switches, or lighted handle toggle switches shall control fans. In these cases, thermal overload switches shall be furnished and installed by Division 26 Contractor where indicated on the plans.

C. Roof Fans - Manually Controlled:

1. 208 volt, 3 phase.

2. Integral disconnect switch provided by equipment Manufacturer.

3. Remote combination starter/disconnect switch (HOA TYPE) shall be furnished and installed by Division 26 Contractor.
4. Start/Stop pushbutton and/or lighted handle switch shall be furnished and installed by Division 26 Contractor, coordinate location with owner.

D. Roof Mounted Air Handling Units (Outdoor):
1. 208 volt, 3 phase.
2. Starters with overload protection shall be furnished and installed by equipment Manufacturer.
3. Division 26 Contractor shall furnish and install a fused weatherproof disconnect switch.
4. All wiring to the respective devices in the unit shall be factory installed by the equipment Manufacturer.
5. Control transformers with weatherproof enclosure shall be provided and wired by Division 23 Contractor.

E. Ductless Mini-Split Heating/Cooling System (Split System):
1. 208 volt, 1 phase
2. 2-pole toggle switch to be furnished and installed adjacent to the fan by Division 26 Contractor.
3. Control transformers shall be furnished and installed by Division 23 Contractor.
4. Division 26 Contractor shall furnish and install a 120 volt duplex weatherproof receptacle for condensate pump.

F. Outdoor Condensing Units for Ductless Mini-Split Heating/Cooling System (Split System):
1. 208 volt, 1 phase
2. Starters with overload protection shall be furnished and installed by equipment Manufacturer.
3. Division 26 Contractor shall furnish and install a fused weatherproof disconnect switch.
4. All wiring to the respective devices in the unit shall be factory installed by the equipment Manufacturer.
5. Control transformers with weatherproof enclosure shall be furnished and installed by Division 23 Contractor.

G. Electric Heating Coils:
1. 208 volt, 1 and 3 phase.
2. Fused disconnect switch in unit by equipment Manufacturer if not provided the EC shall shall furnish and install a disconnect switch by Division 26 Contractor.
3. Division 23 Contractor shall provide any other connections and/or equipment required.

H.

3.6 CONTRACTOR RESPONSIBILITIES (PLUMBING CONTRACT)

A. Water Heater Natural Gas:

1. 120V, 1 phase.
2. Integral factory wired control panel shall be provided by the Manufacturer.
3. Division 26 Contractor shall furnish and install a fused disconnect switch adjacent to unit and extend power wiring to terminals in control panel and connect as required.
4. All other control wiring shall be by the Division 23 Contractor.

B. Pumps:

1. 208V volt, single phase.
2. Thermal overload switch shall be furnished and installed by Division 23 Contractor. Division 26 contractor install switch adjacent to the unit.

END OF SECTION 26 18 00

SECTION 26 2416- PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

C. Field quality-control reports.

D. Panelboard schedules for installation in panelboards.

E. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Mains: Circuit breaker or Fused switch.

E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. External Control-Power Source: 120-V branch circuit .

F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

G. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Communication Capability: Circuit-breaker-mounted Universal-mounted Integral Din-rail-mounted communication module with functions and

features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."

f. Shunt Trip: 120 -V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407 NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Mount top of trim 90 inches above finished floor unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

I. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Electrical Identification."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 2416

SECTION 26 2726- WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches and wall-box dimmers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 5361 (single), 5362 (duplex).
    b. Hubbell; HBL5361 (single), 5362 (duplex).
    c. Leviton; 5361 (single), 5362 (duplex).
    d. Pass & Seymour; 5361 (single), 5362 (duplex).

3. Color of devices on this project shall be white, U.O.N.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; GF20.
    b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).

d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2. Color of devices on this project shall be white, U.O.N.

C. Pilot Light Switches, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 2221PL for 120 V and 277 V.
b. Hubbell; HPL1221PL for 120 V and 277 V.
c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
d. Pass & Seymour; PS20AC1-PLR for 120 V.

3. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

4. Description: Single pole, with factory-supplied key in lieu of switch handle.

D. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d. Pass & Seymour; 1251.

2.5 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 1500 W; dimmers shall require no derating when ganged with other devices. Illuminated when "OFF."

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.6 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.035-inch-thick, satin-finished stainless steel
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant , die-cast aluminum with lockable cover.

2.7 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, die-cast aluminum with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening

2.8 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: white, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Devices mounted within wood paneling shall be brown

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor’s “Waste Management Plan” as required by Division 01 Section "Construction Waste Management."

3.2 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Install products in accordance with manufacturer's instructions.
11. Install devices plumb and level.
12. Install switches with OFF position down.
13. Install wall dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by Manufacturer.
14. Do not share neutral conductor on load side of dimmed circuits.
15. Install receptacles with grounding pole on top.
16. Connect wiring device grounding terminal to outlet box with bonding jumper and to branch circuit equipment grounding conductor.
17. Install wall plates on switches, receptacles, and blank outlets.
18. Use jumbo size plates for outlets installed in masonry walls.
19. Install zinc or cadmium plated steel plates on surface mounted cast Feralloy boxes and junction boxes.
20. Install stainless steel plates on surface mounted cast aluminum boxes.
21. For all new kitchens located in “other than dwelling units,” ground fault circuit interrupter receptacles shall be installed at all locations and not limited to countertop receptacles.
22. Ground fault circuit interrupter receptacles shall be provided within twenty-five feet, zero inches of all HVAC equipment and not limited to equipment on rooftops, attics and crawl spaces.
23. Install hospital grade receptacles in health care facilities per Article 517 of the NEC.
24. Dimmer switches shall be used only to control permanently installed lighting fixtures and not used to control receptacles.
25. Receptacles installed outdoors in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.
26. Receptacles located within the patient care areas of pediatric wards, rooms, or areas shall be listed tamper-resistant or shall employ a listed tamper-resistant cover.
27. The cover plates for the electrical receptacles or the electrical receptacles themselves supplied from the emergency system of a hospital shall have a distinctive color or marked so as to be readily identifiable.
28. GFCI receptacles shall be provided and installed at outdoor and damp or wet locations associated with agricultural buildings.
29. All 15 and 20 amp receptacles located in elevator hoistways, pits, cartops shall be GFCI type.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black white red-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION 26 2726

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.

D. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer source of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight ON pilot light.
3. Isolated neutral lug.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.
6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac 24-V dc coil voltage.
7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Alarm Switch: One NC contact that operates only when circuit breaker has tripped.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 2816

SECTION 26 2913 - ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Manual motor controllers.

B. Combination magnetic motor controllers (circuit breaker and).

1.3 SUBMITTALS

A. Submit under provisions of Section 260510.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and over-current protective devices, short circuit ratings, dimensions and enclosure details.

C. Test Reports: Indicate field test and inspection procedures and test results.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of Product.

E. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.4 QUALTIY ASSURANCE

A. Perform work in accordance with NECA Standard of Installation.

B. Comply with NFPA 70.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five years experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D Company.

B. General Electric.

C. Siemens ITE.

D. Allen-Bradley Company.

2.2 MANUAL MOTOR CONTROLLER (THERMAL SWITCH)

A. Description: NEMA ICS 2, AC general purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit. Where indicated on the drawings, provide red green pilot light and key toggle operator.

B. Enclosure: ANSI/NEMA ICS 6, Type 1, 1 FLUSH 3R as indicated on drawing.

2.3 CIRCUIT BREAKER TYPE COMBINATION MAGNETIC MOTOR CONTROLLERS (NON-REVERSING)

A. Description: Combine magnetic motor controllers with thermal magnetic circuit breaker motor circuit protector disconnect in common enclosure.

1. Thermal Magnetic Circuit Breakers: NEMA AB 1, with integral thermal and instantaneous magnetic trip in each pole. Circuit breaker shall have a color coded externally operated handle. Operating handle shall give positive visual indication of ON-OFF with red and black color-coding.

2. Motor Circuit Protector: NEMA AB 1, circuit breakers with integral instantaneous magnetic trip in each pole. Circuit breaker shall have a color-coded externally operated handle. Operating handle shall give positive visual indication of ON-OFF with red and black color-coding.

B. Magnetic Motor Controllers: NEMA ICS 2, AC general purpose Class A magnetic controller for induction motors rated in horsepower.

C. Coil Operating Voltage: 120 volts, 60Hz.

D. Coil: Be of encapsulated type.

E. Poles: Three.

F. Size: As indicated.

G. Contacts: Totally enclosed, double-break, silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

H. Wiring: Straight through wiring with all terminals clearly marked.

I. Overload Relay: NEMA ICS; melting alloy with one piece thermal unit construction. Thermal units shall be interchangeable. Overload relay control circuit contact shall be replaceable. Thermal units shall be required for starter to operate.

J. Enclosure: ANSI/NEMA ICS 6, Type 1. as required to meet conditions of installation .

K. Accessories:

1. Auxiliary Contacts: NEMA ICS 2, 2 each normally open, closed, field convertible contacts in addition to seal-in contact.
2. Cover Mounted Pilot Devices: NEMA ICS 2, heavy duty oiltight type.
3. Pilot Device Contacts: NEMA ICS 2, Form Z, rated A150.
4. Push Buttons: Covered Lockable type.
5. Indicating Lights: LED type.
6. Selector Switches: Rotary type.
7. Relays: NEMA ICS 2.
8. Control Power Transformers: 120 volt secondary, starter. as scheduled. Provide fused primary and secondary and bond unfused leg of secondary to enclosure.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 INSTALLATION

A. Install enclosed controllers where indicated in accordance with Manufacturer's instructions.

B. Install enclosed controllers plumb. Provide supports in accordance with Section 26.

C. Mounting Height: as indicated on drawings to operating handle.

D. Install fuses in fusible switches.

E. Select and install overload heater elements in motor controllers to match installed motor characteristics.

F. Provide engraved plastic nameplates under the provisions of Section 16195.

G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor and voltage/phase rating.

3.3 FIELD QUALITY CONTROL

A. Inspect and test each enclosed controller to NEMA ICS 2.

3.4 DELIVERY, STORAGE AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances and physical damage.

B. If stored in areas subjected to weather, cover enclosed controllers to protect from weather, dirt, dust, corrosive substances and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

3.5 APPLICATION

A. Provide UL listed (UL 489) circuit breakers for use with heating, air-conditioning and refrigeration equipment comprising multimedia or combination loads are marked “Listed HACR Type”. Where the equipment marking specifies fuses, or HACR Type circuit breakers, the circuit is intended to be protected only by the type of protective device specified.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit breaker trip ranges.

3.7 STARTUP SERVICE

A. Engage a factory authorized service representative to perform startup service.

B. Verify that enclosed controllers are installed and connected according to the Contract Documents.

3.8 DEMONSTRATION

A. Engage a factory authorized service representative to train Owner’s maintenance personnel to adjust, operate and maintain enclosed controllers. Allow 4 hours for Owner’s training.

END OF SECTION 26 2913

SECTION 26 4210 - ELECTRIC SERVICE

PART 1 GENERAL

1.1 STIPULATIONS

General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

Arrangement with utility company for permanent electric service.

Underground service entrance.

1.3 SYSTEM DESCRIPTION

Utility Company: PECO Energy Company

1. System Characteristics: 208Y/120 volts, 3 phase, 4 wire, 60 Hertz.

1.4 QUALITY ASSURANCE

Perform Work in accordance with utility company written requirements.

Maintain one copy of each document on site.

1.5 REGULATORY REQUIREMENTS

Conform to requirements of ANSI/NFPA 70.

1.6 FIELD MEASUREMENTS

Verify that field measurements are as indicated on utility company drawings.

PART 2 PRODUCTS

2.1 Pole Mounted TRANSFORMER

Conform to PECO specifications.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's

"Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 UTILITY/CONTRACTOR COORDINATION

PECO will provide the following:

1. High-voltage switch (if applicable)
2. Pad mounted transformer and ground grid around transformer (if applicable).
3. All primary cable with connectors and connections.
4. Electric metering current transformers inside the current transformer with wiring and connections.
5. Furnish electric meter enclosure for installation by the Division 26 Contractor.
6. Secondary cables between transformer and termination cabinet, current transformer including connections to line side of current transformer.

Division 26 Contractor will provide the following:

7. Excavation, backfilling and concrete encased conduits for the main primary feeder from the existing PECO power pole manhole to the the new pad mounted transformer.
8. Transformer vault/pad and installation of vault per PECO requirements.
9. Excavation, backfilling and concrete encased conduits for the main secondary feeder from the transformer vault/pad to the new main ATS or switchboard.
10. Secondary cables between transformer and new main ATS or switchboard.
11. Install electric meter on termination cabinet per PECO requirements.
12. 1, 1/4 inch conduit from the current transformer cubicle to the meter location.

Division 26 Contractor shall contact with PECO at for specific instructions regarding their service requirements before beginning this phase of his work. All service work shall be in complete compliance with PECO requirements, codes and regulations.

Owner shall be responsible for all costs incurred by PECO to bring electric service to building.

Make all arrangements necessary to obtain electrical service from PECO.

Obtain all necessary standards and detail drawings from PECO before construction of service equipment is commenced.

PECO's service data as shown is accurate as determined on the date of specification issue and shall be verified as specified herein above.

Verify that service equipment is ready to be connected and energized.

END OF SECTION

SECTION 264220 - TELECOM SERVICE

PART 1 GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Arrange with Local Service Provider for permanent telephone/data service.

B. Underground telephone/data service.

PART 2 PRODUCTS - Not used.

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 UTILITY/CONTRACTOR COORDINATION

A. Contractor shall contact the local service provider for specific instructions regarding the service requirements before beginning this phase of work.

B. Division 26 Contractor will provide conduit with pull wires.

C. Local service provider will provide telephone, data. fiber service cables to, and termination equipment at, the telephone backboard/data rack.

D. Cost and fees incurred by the local service provider to bring telephone/data service to the building will be the responsibility of the building/property owner.

E. Contractor to provide grounding as required by the local service provider at the telephone/data equipment.

END OF SECTION

SECTION 264960 - AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Automatic transfer switch and bypass/isolation switch.

1.3 SUBMITTALS

A. Submit under provisions of Section 260510.

B. Product Data: Provide catalog sheet showing voltage, switch size, ratings and size of switching and over-current protective devices, operating logic, short circuit ratings, dimensions and enclosure details.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 260510.

B. Operation Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running.

C. Maintenance Data: Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials and replacement parts.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five years experience and with service facilities within 100 miles of Project.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.7 MAINTENANCE SERVICE

A. Furnish service and maintenance of transfer switch for one year from Date of Substantial Completion.

1.8 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of Section 260510.

B. Provide two of each special tool required for maintenance.

1.9 QUALITY ASSURANCE

A. Comply with NEMA ICS 1.

B. Comply with NFPA 70.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. UL 1008 standard for transfer switch equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Automatic Switch Company (ASCO).

B. Russelectric, Inc.

2.2 MECHANICALLY HELD TRANSFER SWITCH DESIGN

A. The transfer switch shall be electrically operated and mechanically held. The electrical operator shall be a momentarily energized, single-solenoid mechanism. Main operators which include overcurrent disconnect devices, linear motors or gears shall not be acceptable. The switch shall be mechanically interlocked to ensure only two possible positions, normal or emergency. Linear motor designs are not acceptable.

B. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

C. Where neutral conductors must be switched as shown on the plans, the ATS shall be provided with fully rated 4^{TH} pole switched neutral.

D. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

2.3 AUTOMATIC TRANSFER AND BYPASS/ISOLATION SWITCH

A. Description: NEMA ICS 2, automatic transfer switch with manual bypass switch.

B. Configuration: Drawout type electrically operated, mechanically held transfer switch with manually operated CONNECTED, TEST and ISOLATED drawout positions and with mechanically operated, mechanically held transfer switch connected to bypass automatic switch in both NORMAL and EMERGENCY positions.

C. Bypass Switch Ratings: Match automatic transfer switch for electrical ratings.

D. Closed-transition type.

2.4 RATINGS

A. Voltage: 120/208 volts, three phase, four wire, 60Hz.

B. Switched Poles: Three.

C. Load Inrush Rating: Resistive load.

D. Continuous Rating: As indicated on Drawings.

E. Withstand Current Rating: 65,000 RMS symmetrical amperes when used with molded case circuit breaker. 100,000 RMS symmetrical amperes when used with Class J, L, K1, current limiting fuse.

2.5 PRODUCT ACCESSORIES

A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION, NORMAL BYPASS.

B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.

C. Transfer Switch Auxiliary Contacts: 1 normally open; 1 normally closed.

D. Normal Source Monitor: Monitor each line of normal source voltage and frequency, initiate transfer when voltage drops below 85 percent or frequency varies more than 4 percent from rated nominal value; initiate re-transfer to normal when at least 90 percent of normal voltage is available.

E. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 80 percent or frequency varies more than 4 percent from rated nominal value.

F. In-Phase Monitor: Inhibit transfer until source and load are within 70 percent of rated voltage and frequency.

G. Insulated neutral plate.

H. Integral four pole 30 A, electrically operated, electrically held contactor to provide controlled power to the “emergency only” loads. Provide fuse block with three 20 A fuses between alternate source and contactor.

I. Power Meter with (8) solid state inputs, (4) relay output contacts

1. Current, per phase RMS and neutral
2. Real Power (KW)
3. Apparent Power (KVA)
4. Reactive Power (KVAR)
5. Accumulated real energy KWH

2.6 AUTOMATIC SEQUENCE OF OPERATION

A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

B. Time Delay to Start Alternate Source Engine Generator: 0 to 60 seconds, adjustable. Set at 1 second.

C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

D. Time Delay Before Transfer to Alternate Power Source: 0 to 60 seconds, adjustable. Set at 1 second.

E. Initiate Re-transfer Load to Normal Source: Upon permission by normal source monitor.

F. Time Delay Before Transfer to Normal Power: 1 to 30 minutes, adjustable; bypass time delay in event of alternate source failure. Set at 5 minutes.

G. Time Delay Before Engine Shut Down: 1 to 30 minutes, adjustable of unloaded operation. Set per Manufacturer's recommendation.

H. Engine Exerciser: Start engine every 7 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

2.7 ENCLOSURE

A. Enclosure: NEMA 1, suitable for wall mounting.

B. Finish: Manufacturer's standard enamel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for transfer switch installation.

3.2 INSTALLATION

A. Install transfer switches in accordance with Manufacturer's instructions.

B. Extend control wiring from alternate source through normally open contacts of voltage sensing relay monitoring alternate source; to operate coil of integral contactor.

C. Provide engraved plastic nameplates under provisions of Section 260553.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate and maintain transfer switches and related equipment as specified below:

1. Coordinate this training with that for generator equipment.
2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing and maintaining equipment.
3. Schedule training with Owner; with at least seven days advance notice.
4. Provide a minimum of four hours of instruction.

3.4 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt and debris. Repair damaged finish to match original finish.

B. Clean equipment internally, on completion of installation, according to Manufacturer's written instructions.

3.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 260510.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris and traffic.

C. Handle in accordance with Manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

3.6 FIELD QUALITY CONTROL

A. Testing: Test transfer switch products by operating them all in modes. Perform tests recommended by Manufacturer under the supervision of Manufacturer's factory-authorized service representative. Correct deficiencies and report results in writing. Record adjustable relay settings.

B. Testing: Perform the following field quality control testing under the supervision of the Manufacturer's factory-authorized service representative in addition to tests recommended by the Manufacturer.

1. Before energizing equipment, after transfer switch products have been installed:
    a. Measure insulation resistance phase-to-phase and phase-to-ground with insulation resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by Manufacturer. Meet Manufacturer's specified minimum resistance.
    b. Check for electrical continuity of circuits and for short circuits.
    c. Inspect for physical damage; proper installation and connection and integrity of barriers, covers and safety features.
    d. Verify that manual transfer warnings are properly placed.

e. Perform manual transfer operation.

2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

   a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

   b. Simulate loss of phase-to-ground voltage for phase of normal source.

   c. Verify time delay settings.

   d. Verify pickup and dropout voltages by data readout or inspection of control settings.

   e. Test bypass/isolation unit functional modes and related automatic transfer switch operations.

   f. Perform contact resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.

   g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power and engine cool-down and shutdown sequence.

END OF SECTION

SECTION 264990 - PACKAGED ENGINE GENERATOR SYSTEMS

PART 1 GENERAL

1.1 STIPULATIONS

A. General provisions of the Contract Documents including General and Supplementary Conditions and Division 1 Specifications Sections apply to all work in this section.

1.2 WORK INCLUDED

A. Packaged engine generator system.

B. Exhaust silencer and fittings.

C. Battery and charger.

D. Remote control panel.

E. Weatherproof enclosure.

1.3 SUBMITTALS

A. Submit under provisions of Section 260510.

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.

C. Product Data: Provide data showing dimensions, weights, ratings, interconnection points and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank and remote radiator.

D. Test Reports: Indicate results of performance testing.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation and starting of product.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 260510.

B. Operation Data: Include instructions for normal operation.

C. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear and emergency maintenance procedures.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 110.

B. Comply with current NEC Articles 695, 700, 701, 702 and 705.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years experience and with service facilities within 100 miles of the project.

B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.

1.7 MAINTENANCE MATERIALS

A. Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal toolbox.

1.8 EXTRA MATERIALS

A. Provide two of every fuse, indicator lamps used.

B. Provide two of each fuse, oil and air filters.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Kohler (Rehlko) Company

B. Onan Corporation

C. Caterpillar, Inc.

D. MTU On-Site Energy

2.2 PACKAGE ENGINE GENERATOR SYSTEM

A. Level 1 applications are legally required emergency systems (current NEC, Article 700.1)

B. Level 2 applications are standby systems (current NEC, Article 701.2).

C. NFPA 99 applies to healthcare facilities.

D. Description: NFPA 110, engine generator system to provide source of power for Level 1 and 2 applications and conforming to NFPA 99.

E. System Capacity: kVA at standby prime rating as indicated on drawings using engine-mounted radiator.

2.3 ENGINE

A. Type: Air-cooled inline or V-type, four stroke cycle, two stroke cycle electric ignition internal combustion engine.

B. Prime Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees Fahrenheit.

C. Fuel System: Natural gas.

D. Engine Speed: 1800 rpm.

E. Governor: To maintain engine speed within 0.5 percent, steady state and 5 percent no load to full load with recovery to steady state within two seconds following sudden load changes. Equip governor with means for manual operation and adjustment.

F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, over speed, engine over crank and low coolant level. Limits as selected by manufacturer.

G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.

H. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees Fahrenheit (32 degrees Celsius) and suitable for operation on 120 volts AC.

I. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees Fahrenheit . Radiator air flow restriction 0.5 inches of water (1.25 PA) maximum.

J. Engine Accessories: Lube oil filter, intake air filter, lube oil cooler, gear-driven water pump. Include fuel pressure gauge, water temperature gauge and lube oil pressure gauge on engine/generator control panel.

K. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

L. Comply with NFPA 37.

2.4 GENERATOR

A. Generator: NEMA MG 1, three phase, four pole, reconnectable brushless synchronous generator with brushless exciter.

B. Rating: indicated on drawings, at 0.8 power factor, 208Y/120 volts, 60 Hz at 1800 rpm.

C. Insulation: Class H.

D. Temperature Rise: 130 degrees Celsius standby.

E. Enclosure: sound attenuated, weather-proof.

F. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage drop, (plus or minus 5 percent) and voltage gain.

2.5 ACCESSORIES

A. Exhaust Silencer: Critical type silencer with muffler companion flanges and flexible stainless steel exhaust fitting sized in accordance with engine manufacturer's instructions.

B. Batteries: Heavy duty, lead-calcium storage batteries. Capacity shall be as recommended by manufacturer for the specified application level. Match battery voltage to starting system. Include necessary cables and clamps. Provide anti-corrosion seals on terminal posts.

C. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.

D. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter and 120 volts AC fused input. Provide wall-mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.

E. Flexible Oil Drain Extension: When uncoiled, capable of extending 6 inches beyond pad edge. Provide petcock with flexible oil drain extension.

F. Line Circuit Breaker: NEMA AB 1 molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with ANSI/NFPA 70. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure. Mount unit in enclosure to meet NEMA 250, Type 1 requirements on generator.

G. Engine-Generator Control Panel: NEMA 250, Type 1, generator mounted control panel enclosure with engine and generator controls and indicators. Include the following equipment and features:

1. Frequency Meter: 45-65 Hz range, 3.5 inch dial.
2. AC Output Voltmeter: 3.5 inch dial., 2 percent accuracy with phase selector switch.
3. AC Output Ammeter: 3.5 inch dial., 2 percent accuracy with phase selector switch.
4. Output Voltage Adjustment.
5. Push-to-Test Indicator Lamps: One each for low oil pressure, high water temperature, over speed and over crank.
6. Engine Start/Stop Selector Switch.
7. Engine Running Time Meter.
8. Oil Pressure Gauge.
9. Water Temperature Gauge.
10. Low Oil Pressure Pre-alarm - Audio and Visual.
11. High Water Temperature Pre-alarm - Audio and Visual.
12. Leak Detection – Audio and visual.
13. Alarm Relay and Horn with Silence Switch.
14. Auxiliary Relay: 3PDT, operates when engine runs with contact terminals pre-wired to terminal strip.

15. Remote Alarm Contacts: Pre-wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110.
16. Remote Annunciator Panel: Surface mounted panel with brushed stainless steel. Provide audible and visible indicators as required by NFPA 110 and as follows coordinate location with owner.
17. High battery voltage (alarm).
18. Low battery voltage (alarm).
19. Low fuel (alarm).
20. System ready.
21. Anticipatory high water temperature.
22. Anticipatory low oil pressure.
23. Low coolant temperature.
24. Switch in off position (alarm).
25. Over crank (alarm).
26. Emergency stop (alarm).
27. High water temperature (alarm).
28. Over speed (alarm).
29. Low oil pressure (alarm).
30. Leak detection (alarm).
31. Line power available.
32. Generator power available.
33. Lamp test and horn silence switch.

H. Sound Attenuated Weather Protective Enclosure: Reinforced steel housing allowing access to control panel and service points with lockable doors and panels. Include fixed louvers, battery rack and silencer. The housing shall provide 25 dB of attenuation at 21'.

I. Vibration Isolators: Spring type with neoprene pads.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount on vibration isolators.

C. Permanently connect battery charger cables to batteries.

D. Fill diesel LP fuel tank.

E. Clean all fuel system components prior to installation and initial start-up.

F. Contractor shall provide all conduit, wiring and connections to control panel to ATS and remote annunciator as required by manufacturer's requirements and/or recommendations; provide engine start circuit, battery charger circuit, battery heater

circuit, engine jacket heater circuit and all control circuits for a complete and operational system.

G. Exhaust piping to exhaust silencer and from exhaust silencer to exterior shall be by Division 23 Contractor. Insulation for exhaust system by Division 23 Contractor.

H. Engine-generator control panel shall be mounted on the generator in a location that allows maintenance personnel to observe them readily without changing position from a logical maintenance work position at the generator.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 260550.

B. Provide full load test utilizing portable test bank, if required, for 4 hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, automatic shutdown and return to normal.

C. Record in 20 minute intervals during the first 4 hour test:

1. Kilowatts.
2. Amperes.
3. Voltage.
4. Coolant temperature.
5. Room temperature.
6. Frequency.
7. Oil pressure.

D. Test alarm and shutdown circuits by simulating conditions.

3.3 MAINTENANCE AND SERVICE AGREEMENT

A. Manufacturer shall provide maintenance and service for the engine generator systems for a period of 3 years after the date of final acceptance. Maintenance agreement shall include the following services:

1. Off hours operational test under building/plant load to verify system operation.
2. Check fluid levels.
3. Change oil and filter twice yearly.

3.4 ADJUSTING

A. Adjust operating mechanisms for free mechanical movement. Calibrate motors and instrumentation to the accuracy specified or required for proper operation.

B. Adjust generator output voltage and engine speed.

3.5 CLEANING

A. Clean engine and generator surfaces. Replace oil and fuel filters.

3.6 DEMONSTRATION

A. Simulate power outage by interrupting normal source and demonstrate that system operates to provide emergency and standby power.

B. Instruction shall be provided by factory trained representative(s) of the system supplier. Allow 4 hours for Owner instruction.

C. The manufacturer shall provide written certification that the engine generator system are complete and operating in accordance with all warranty requirements.

3.7 PERFORMANCE

A. The generator shall be capable of starting and achieving rated voltage and frequency within 10 seconds following the closing of the contact in the cranking circuit.

3.8 WARRANTY

A. Manufacturer shall provide written warranty covering all equipment furnished under this section. Warranty shall cover all defects in materials and/or workmanship for a period of 2 year from date of final acceptance of equipment by the Owner and shall include all costs of parts, labor, travel and living expenses for the manufacturer's service representative. The manufacturer shall respond to all requests for warranty service within 4 hours.

3.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site in protective wrappings, containers and other protection that will exclude dent and moisture and prevent damage from construction operations.

B. Accept unit on site on skids. Inspect for damage.

END OF SECTION

SECTION 26 5100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures and drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. See Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

C. See Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

D. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with all requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the manufacturers specified and/or equal product of alternate manufacturer, where indicated, subject to Shop Drawing approval.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

H. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least **0.125 inch** minimum unless different thickness is indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 EXIT SIGNS

A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
   1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.4 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

   1. Battery: Sealed, maintenance-free, nickel cadmium, or as specified.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
   4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
   5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, **12 gauge**.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, **12 gauge**.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.6 LED LUMMINAIRES AND DRIVERS

A. All Luminaire

1. Comply with IES LM-79-08 Approved Method for measuring lumen maintenance of LED light sources.
2. Comply with IES LM-80-08 Approved Method for electrical and photometric measurement of SSL product
3. Comply with In-Situ testing for more reliable results.
4. LED's shall be Restriction of Hazardous Substances Directive (RoHS) compliant.
5. LED arrays shall be sealed, high performance, long life type; minimum 70% rated output at 50,000 hours.
6. LED luminaires shall deliver a minimum of 60 lumens per watt.
    a. LED's shall be "Bin No. 1" quality.
7. Drivers shall be solid state and accept 120 through 277 VAC at 60 Hz input.
8. The LED light source shall be fully dimmable with use of compatible dimmers switch designated for low voltage loads.
9. LED color temperatures: CRI> 85, 2700K as noted +/- 145K.
10. LED color temperatures: CRI> 85, 4000K as noted +/- 275K.
11. LED color temperatures: CRI> 85, 5000K as noted +/- 283K.
12. Luminaires shall have internal thermal protection.
13. Luminaires shall not draw power in the off state. Luminaires with integral occupancy, motion, photo-controls, or individually addressable luminaires with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.
14. Color spatial uniformity shall be within .004 of CIE 1976 diagram.
15. Color maintenance over rated life shall be within .007 of CIE 1976.
16. Indoor luminaires shall have a minimum CRI of 85.
17. Luminaire manufacturers shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management
18. LED package(s)/module(s)/array(s) used in qualified luminaires shall deliver a minimum 70% of initial lumens, when installed in-situ, for a minimum of 50,000 hours.
19. Luminaires shall be fully accessible from below ceiling plane for changing drivers, power supplies and arrays.

B. Power Supplies and Drivers
1. Power Factor: 0.90 or higher
2. Maximum driver case temperature not to exceed driver manufacturer recommended in- situ operation.
3. Output operating frequency: 60Hz.
4. Interference: EMI and RFI compliant with FCC 47 CFR Part 15.
5. Total Harmonic Distortion Rating: 20% Maximum.
6. Meet electrical and thermal conditions as described in LM-80 Section 5.0.
7. Primary Current: Confirm primary current with Drawings.
8. Secondary Current: Confirm secondary current specified by individual luminaire manufacturers.
9. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified control components.
10. Solid-state control components to be integral or external per each specified luminaire. Remote control gear to be enclosed in Class 1, Class 2, or NEMA 3R enclosures as required.

C. Controller and Control System

1. System electronics driver/controller to use coordinated communication protocols: DMX512, 0-10V, DALI, or proprietary as required.

2. The Contractor to ensure that external control equipment is compatible with LED control requirements.

3. Provide connector types and wiring as appropriate for un-interrupted communication between devices, considering distance maximums, field obstructions, and accessibility. Ensure that connection points are optically isolated for system noise reduction.

4. For control components that are part of overall area control system see Dimming Controls Specifications.

5. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified power supplies and/or drivers.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 26 5100

SECTION 26 5600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.

B. See Division 26 Section "Interior Lighting" for addexterior luminaires normally mounted on exterior surfaces of buildings.

1.3 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C2, "National Electrical Safety Code."

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Exterior Lighting Device Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with all requirements, manufacturers offering products that may be incorporated into the Work include, but are not

limited to the manufacturers specified and/or equal product of alternate manufacturer, subject to Shop Drawing approval.

2.2 LUMINAIRES, GENERAL REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Color as selected by Architect. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

N. Factory-Applied Finish for Aluminum Luminaires: Color as selected by Architect. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.3 LED DRIVERS AND ARRAYS

A. UL 1598 listing.

B. LED arrays shall have LED's that produce minimum 55 lumens/watt when operated at 350mA.
   1. Lumen Depreciation Data: At 40 deg C ambient, the L70 hours shall be 50,000 at 520 mA driver.
   2. LED color: neutral white, 4100 deg K, CRI of 75.

C. Drivers shall accept 120 through 480 volts, 50/60 Hz.

D. The housing shall have an integral thermal management system with extruded aluminum radiation fins and lateral airways.

E. Comply with IES LM-79-08 and LM-90-08 Approved Methods.

F. Comply with In-Situ testing for more reliable results.

G. LED's shall be Restriction of Hazardous Substances Directive (RoHS) compliant.

2.4 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

   1. Relay with locking-type receptacle shall comply with NEMA C136.10.
   2. Adjustable window slide for adjusting on-off set points.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

END OF SECTION 26 5600

SECTION 27 0790- GENERAL REQUIREMENTS FOR TELECOMMUNICATIONS WORK

PART 1 - GENERAL

1.1 REALATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The Specification Sections “General Conditions” and Special Requirements” form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

C. The Specification Section general provisions section number and title for your discipline here forms a part of this section and shall have the same force and effect as if printed herewith in full.

D. The Contractor is informed that this project may be applied for under the Universal Service Grant Program (E-Rate). The Contractor shall include in his bid price any and all work necessary to assist the Owner in completion of the Forms 470,471, and 486.

E. The Contractor shall submit his qualification as outlined in the Bid documents reference Appendix A for Telecommunication Contractor Qualification Form prior to shop drawings submittal and before any work is done. The Engineer reserves the right to reject the submitted Sub-Contractor on non-qualification.

F. All sections of this document are binding upon each Contractor involved insofar as it can or does apply to the Contractor’s work.

1.2 WORK INCLUDED

A. This Contractor shall furnish, install and connect a new low-voltage data and phone system to serve the renovated building, in accordance with these specifications, Owner’s IS department and accompanying contract drawings. This shall all include required labor materials, apparatus and supervision.

1.3 DEFINITIONS

A. Contractor: “Bidder”, “Contractor”, this Contractor”, “Telecommunications Contractor” or Systems Integrator” when used in this specification refers to the Contractor responsible for all work under this Section. Specific Sections of the Specification refer to specialized work and require persons with specialized skill sets. They are detailed as follows:
   1. Structured Cabling System.
   2. Data Network Electronics.
   3. VOIP Telephone System.
   4. Grounding and Bonding System.

B. Sub-Contractor: Any reference to, or letting of work contained in these specifications to any Subcontractor of Manufacturer does not relieve this Contractor of his responsibility for all work, material and equipment in this specification.

C. Provide: The term" Provide" when used separately, shall mean to "Furnish and Install".

D. Furnish: The term "Furnish" when used separately, shall mean to obtain and deliver to the project site, for installation by others.

E. Install: The term "Install" when used separately, shall mean to mount in place, connect and make operable.

F. Gauge of Materials: The sizes of copper conductors and thickness of metals shown on the drawings or mentioned herein shall be understood to be American Wire Gauge for conductors and US Gauge for sheet metal.

G. Singular Number: Any reference made to an item in the singular number shall apply equally to as many identical items that work may require.

1.4 REGULATIONS AND CODES

A. All applicable laws, ordinances, rules and regulations of public bodies bearing on the conduct of the work, including but not limited to the following are hereby incorporated and made part of these specifications.
   1. State Department of Health
   2. Department of Labor and Industry
   3. National Fire Protection Association
   4. Americans with Disabilities Act
   5. The Owner's Insuring Agency.

B. Should any change in the drawings and/or specifications be required to conform to the codes, ordinances, regulations or laws mentioned above, The Engineer shall be notified prior to the time of submitting bids. After signing of the Contract, each Contractor will be responsible for the completion of all work necessary to meet the above-mentioned requirements without additional expense to the Owner.

C. The Contractor shall comply with all rules, regulations and recommendations of any public utility serving this project.

D. The entire installation and all telecommunications systems shall be installed in accordance with:
   1. The latest edition of the National Electrical Code approved by the governmental body having jurisdiction, including amendments thereto.

1.6 DRAWINGS AND SPECIFICATIONS

A. The drawings are generally diagrammatic and indicative of the work to be installed. Exact locations of equipment and points of termination shall be approved by the Engineer. Should it be found that any system or equipment cannot be installed as shown

on the drawings, the Architect or Engineer shall be consulted before installing or making changes to the layout.

B. The drawings and specification are intended to function as a common set of documents. Anything shown on the drawings but not in the specifications, or mentioned in the specifications and not shown on the drawings, shall be equally binding as if both noted on the drawings and called for in the specifications.

C. The Contractor is expected to provide complete and 100% operational systems, and is soley responsible to insure that the Owner's requirements are met.

D. If necessary components or details are not listed but will effect the outcome of the systems, the Contractor will notify the Engineer, who will make a determination as to the best solution to meet the intent of the Specification and the Owner's requirements. The Engineer will issue an addendum to all bidders, and the additions shall be reflected in the Contractors bid. After contract issuance, any cost for components that are missing become the responsibility of the Contractor.

E. The scale of the drawings is believed to be accurate based on information provided by the Architect/and or Owner. The Contractor shall verify the actual dimensions in the field prior to starting the work. Any deviations from the drawings scaled dimensions shall be brought to the attention of the Architect or Engineer prior to starting the work. No consideration for changes due to dimensional variances will be considered during installation or after the work has been installed.

F. The Telecommunications Contractor is notified that he is responsible to coordinate his work with all other Prime Contractors, especially the Electrical Contractor.

    1. Conduit raceways, sleeve, boxes, cable runway, cable trays, grounding power circuits and penetrations will be provided by the Electrical Contractor.

    2. Conduit raceways, sleeve, boxes, cable runway cable trays, grounding power circuits and penetrations shall be provided by the Telecommunications Contractor.

1.7 FAMILIARITY WITH CONTRACT REQUIREMENTS

A. It is the responsibility of the Contractor, prior to submitting his bid on this Project, to satisfy himself as to the:
    1. Nature and location of the work.
    2. Character, quality and quantity of the materials which will be required.
    3. Character of equipment and facilities needed preliminary to and during the execution of the work.
    4. General and local conditions, and of all other matters which can in any way affect the work under this Contract.

B. Failure to make an on-site inspection prior to submitting a bid, or failure to comply with any of all of the above requirements will not relieve this Contractor from the

responsibilities of properly estimating the requirements or costs of successful completion of the work nor from the responsibility for the faithful performance of the provisions of this Contract.

1.8 STANDARDS AND REFERENCES

A. Products of workmanship that are specified by association, trade, or federal standards shall comply with the requirements of the following references standards, except when more rigid requirements are specified or are required by applicable codes.

1. ANSI – American National Standard Institute
2. ASTM- American Society for Testing and Materials
3. FM- Factory Mutual System
4. FS – Federal Specification
5. IEE – Institute of Electrical and Electronics Engineers.
6. MIL- Military Specification.
7. NEMA – National Electrical Manufacturer's Association
8. NFPA – National Fire Protection Association
9. UL- Underwritten Laboratories, Inc.
10. ANSI/TIA/EIA-568-B "Commercial Building Telecommunications Cabling Standard" inclusive of all ratified and released sub-section
11. ANSI/TIA/EIA-569-A "Commercial Building Standards for Telecommunications Pathways and Spaces".
12. ANSI/TIA/EIA-606 "The Administration Standard for the Telecommunications Infrastructure of Commercial Building".
13. ANSI/TIA/ EIA-607 "Commercial Building Grounding and Bonding Requirements for Telcommunications.
14. ANSI/TIA/EIA TSB 75 "Additional Horizontal Cabling Practices for Open Offices"
15. Building Industries Consulting Service International, BICSI) Telecommunications Distribution Methods Manual.

1.9 SUBMITTALS

A. Approvals
   1. Materials
      a. The Contractor shall submit to the Engineer, for approval, a complete list of materials and equipment proposed for use on this project.
         1. The list shall include, in itemized form, the name and address of the manufacturer, equipment and when required, the trade name or catalog number of the proposed material.
         2. Other information as required in the associated Telecommunications Section(s).

   2. Sub-Contractors
      a. The Contractor shall submit to the Engineer, for approval, a complete list of sub-contractors proposed for use on this project.
      b. The list shall include, in itemized form, the name and address of the sub-contractor and portion of the work to be performed by

each sub-contractor and portion of the work to be performed by each sub-contractor.

3. Qualifications: Contractor shall submit the qualification of the Telecom Sub-Contractor as per Appendix A requirements. The Engineer shall approve the Contractor (Sub-Contractor) prior to submittal of shop drawings.

B. Shop Drawings
   1. The contractor shall submit to the Engineer, shop drawings, catalog cuts, data sheets, manufacturer's instructions, etc. of all materials and equipment as called for herein and/or as called for in the individual sections for Division 16 under submittals.
   2. Shop drawings submitted for review shall identify the project, contractor, sub-contractor or supplier, pertinent drawing number, detail and specification section number, as appropriate.
   3. Shop drawings shall bear the Contractor's approval stamp, signed or initialed certifying that review, verification of the material required, dimensions, and coordination of the information is in accordance with the requirements of the work and contract documents. Drawings submitted without the Contractor's approval stamp will not be considered and will be returned for resubmission.
   4. No work shall be executed, no orders placed, no material shall be installed until final review has been received.

C. Operation and Maintenance Manuals
   1. The Telecommunications Contractor shall carefully comply during progress of work.
      a. All operation and maintenance manuals including all approved shop drawings.
      b. Methods of care of all types of equipment/materials.
      c. Descriptions of all systems and equipment and methods of operation thereof shall be provided.
         1) Description shall give pertinent diagrams, identifying charts, color-coding, connections and single-line and detailed wiring diagrams.
         2) These instructions shall contain detailed operating and maintenance instructions and complete parts lists for each piece of equipment and trouble shooting/testing procedures so arrange that the maintenance staff may easily follow in case of operating difficulties.
      d. Use manufacturer's printed information where possible; otherwise, obtain written instructions prepared by sub-contractors.
         1) Include names, addresses and phone numbers of all sub-contractors and of service firms for each item located immediately inside the front cover.
         2) The list shall be for the Owner's use after expiration of the guarantee period.
         3) Before completion of the work, submit a rough draft of the manual in a loose-leaf binder for approval by the Owner and Engineer.

   2. After approval and before final payment, furnish 5 corrected bound copies, properly identified for transmittal to the Owner.
      a. All operations and maintenance manuals shall be provided to the Owner not later than 2 weeks prior to commissioning of the installed systems.

D. Guarantee

1. The Telecommunications Contractor shall submit a written 1 year full warranty for the entire telecommunications system (s) provided as part of this project. Where manufacturer standard guarantee provides for a longer period, the longer period shall apply, or where otherwise noted.
2. The Telcommunications Contractor shall provide an extended performance warranty on specified components of the telecommunications system(s) as required in the Related Sections of the document.
3. Where defects in the material, equipment and/or workmanship become evident within the guarantee period, the Contractor shall be responsible for replacing such material and equipment with the approval type of new items; and /or correcting the defective workmanship without any costs to the Owner.

E. Project Record Documents

1. As-built Drawings:

a. The Contractor shall provide complete as-built drawings as part of the project record documents. Hard copy drawings shall be the original as-built drawings with red line modifications and construction note incorporated into the drawings. All soft copy submittals shall be on CD. The CD(s) shall be placed in the document binder with the drawings. All soft copy submittals shall be on CD. The CD(s) shall be place in the document binder with the drawings. Separate sleeves shall be provided with storing the CD(s) in record documents binder. Soft format drawings shall be provided in Auto CAD"dwg format and shall indicate the following:

1) Any alterations to the original plans.
2) NOTE: All changes require prior approval of the Owner and Engineer.
3) The final location of outlets and the final configuration of all telecommunications spaces.

b. The Contractor shall keep 1 complete set of drawings at the job site that shall be used by the Contractor for recording all changes that occur during the construction. The Contractor shall accurately and contemporaneously record on these drawings all changes in the telecommunications work.

c. Upon completion of this project, these drawings shall be incorporated into As-Built" drawings and turned over to the Owner/Engineer.

1) Provide 1 set of red-lines as built drawings shall be provided to the Owner of Owner's designated representative showing all telecommunications outlets, devices, pathways and spaces at the time of the final inspection of the installed system(s).
2) A complete set of telecommunications CAD generated as-built drawings of the telecommunications shall be provide to the Owner not later than 30 days after the installation has been accepted by the Owner.
3) The specific documentation requirements for each telecommunications system are included in the individual Sections(s).

d. Additional Project Information:

1) The Contractor shall provide 4 sets of the information required by this Section. All other project record documents in a separate 3 ring binder with tabbed sections. At a minimum, this information shall include the following.
   a) All field test reports.
   b) All termination (frame) records, cross, connect and patching records including labeling and numbering of all installed components.
   c) Trouble reporting procedures including names, addresses, and phone numbers, hours of operations, escalation procedures and guaranteed response times.
   d) Manufacturer's warranty.
   e) Name of the Contractor's Project Manager and phone number (official contact to the Customer).
   f) Name of the Contractor's and/or Supplier's Technical Support contact and phone number.
   g) Name of the Contractor's and/ or Supplier Account Manger and phone number.
   h) Maintenance schedule for installed equipment.
   i) Any other system specific information as required by the Construction Documents.

e. Training Manuals
   1) Training manuals provided by the Contractor shall reflect all of the training required for the Customer to:
      a. Operate equipment correctly.
      b. Make changes
      c. Test the system(s).
      d. Gather performance statistics
      e. Perform trouble shooting procedures.

1.10 INSPECTIONS

A. The work on this project shall be inspected regularly by the Telecommunications Contractor and periodically by the Owner, Architect, and/or Engineer. Any work failing to pass inspection shall be corrected, repaired or replaced and re-inspected at no additional cost to the Owner. The Contractor shall provide written notice to the Owner and Engineer that corrective action has been completed and is available for re-inspection.

B. The Architect and/or Engineer will conduct periodic inspections of the work during construction of the systems. These inspections will occur on a regular basis and a milestones in the construction phase. These phases include but are not limited to:

   1. Upon completion of conduit and cable tray installation.
   2. After cable pulling and prior to the start of terminations. This inspection may be phased based on the variety of cable systems installed.
   3. During initial termination of cables. This inspection may be phased based on the variety of cable systems installed.
   4. During the initial testing of cables. This inspection may be phased based on the variety of cable systems installed.

5. Upon completion of any wall of floor restoration and installation of firestop materials.
6. During the installation and testing of any major component of the system or piece or equipment.
7. The Contractor shall notify the Architect and / or Engineer at least 48 hours prior to completion of these construction phases so that the work can be inspected.
8. The Contractor shall notify the Architect and/or Engineer of any deficiencies in the work and/or any portion of incomplete work at the time an inspection is conducted.
9. The Architect and/or Engineer shall be notified one week prior to final inspection so that testing may be witnessed.
10. Before requesting a final inspection, the Contractor shall perform an inspection of the work and shall be satisfied that the work is substantially complete and ready for inspection by the Architect and /or Engineer.
11. During the final inspection, the Contractor shall have available in the field copies of the as-built drawings, shop drawings, specifications and test documentation for review during the inspection.

1.11 TESTING

A. Upon completion of the work, all parts of the telecommunications installation shall be tested by the Telecommunications Contractor and proved free of any defects. Preliminary testing will be permitted, but will not be accepted in lieu or obtaining final test results. Final test shall be accomplished by use of proper test equipment for the system being tested. The contractor shall perform testing on each system provided as required by the individual system specification(s).

1.12 SUBSTITUTIONS AND SAMPLES

A. No substitution shall be made without approval. Any substitutions and resulting approvals shall be made in accordance with the requirements of Division 1 – General Conditions. The words “equivalent”, “approved equal” and equal” shall mean equal in all respect in the opinion of the Engineer.
B. The Telecommunications Contractor shall furnish, for review by the Engineer, all samples specified or called for by the Architect or Engineer. Finished work shall match approved samples and shop drawings.
C. When shop drawings are submitted on equipment different from the equipment specified in this and related sections, the Telecommunications Contractor shall relate each item of the submitted equipment to its specified equivalent.
D. At the request of the Engineer, samples of items that are to be used in substitution of specified items shall be submitted. If such a request is made, a sample of both the specified item and the proposed substitute item shall be submitted simultaneously at no cost to the Engineer or Owner. The scheduling of the submission of such samples shall be as directed and shall in no way delay the progress of the project. The Engineer will assume no liability whatsoever for any samples submitted.
E. All costs involved due to substitution of equipment in lieu of that shown on the drawings shall be borne by the Contractor making such substitutions. This shall include but shall not be limited to cost or fees for changes.

1. In the building layout, structure or construction.
2. In the requirements or related equipment
3. To the arrangement of equipment
4. To the work performed, or to be performed by this Contractor or by Others under this and other sections of the specifications.
5. In connection with resubmission of drawings for approval, if required by the Commonwealth of Pennsylvania Owner local authorities or insuring agencies having jurisdiction over the work.

1.13 QUALITY OF WORKMANSHIP

A. All work shall be installed in a first class, neat and workmanlike manner by Technician skilled in the trade involved. The quality of workmanship shall be subject to the approval of the Engineer. Any work found by the Engineer to be of inferior quality and/or workmanship shall be replaced and/or reworked until approval of the Engineer is obtained. Any cost involved in obtaining said approval shall be the responsibility of the Telecommunications Contractor.

1.14 PERFORMANCE OF EQUIPMENT

A. All materials, equipment and appurtenances of any kind, shown on the drawings, hereinafter specified or required for the completion of the work in accordance with the intent of these specification , shall be completely satisfactory and acceptable in operation, performance and capacity. No approval, either written or verbal, of any drawings, descriptive data of samples of such material, equipment and/or appurtenances, shall relieve the Telecommunication Contractor of his responsibility to turn over the same to the Owner in perfect working order at the completion of the work.
B. Any material, equipment, or appurtenances, the operation, capacity or performance of which does not comply with the drawings and/ or specification requirements, or which is not new, or which is damaged prior to acceptance by the Owner, will be held to be defective material and shall be removed and replace with proper acceptable materials, equipment and/ or appurtenances or put in proper acceptable working order, satisfactory to the Architect without additional cost to the Owner.
C. All associated systems provided under this specification, including the Structured Cabling System, or other similar systems shall be furnished by manufacturers who have been regularly engaged in the manufacture of these products for period of not less than five (5) years.
D. This Contractor shall deliver to the Engineer, prior to commencement of work, a statement from the manufacturer or his authorized representative, certifying that the Telecommunications Contractor is completely trained and certified to install proposed systems.
E. All details of the installation of all equipment shall be electrically and mechanically correct. All Equipment shall operate without objectionable noise or vibration as determined by the Engineer and Owner. If objectable noise or vibration is produced and transmitted to occupied portions of the building by apparatus, conduit of other parts of a system, any corrections to eliminate noise and vibration shall be made by the Contractor without cost to the Owner.

1.15 METHODS AND MATERIALS

A. The Telecommunications Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the drawings. Outlets, equipment or wiring improperly placed because of the Telecommunications Contractor's failure to obtain this information shall be relocated and reinstalled by the Telecommunications Contractor without additional expense to the Owner.
B. Each Contractor, upon request of the Architect, shall expedite the work of a specific area, section of part of the project to make provision for , or to permit the installation of, another part of the work, or to protect equipment already installed.
C. All materials and equipment supplied by this Contractor shall be new, of the best of their respective kinds, without imperfections and blemishes, and shall be protected from the elements prior to installation in the building.
D. All wire, cable, wiring devices and equipment shall be installed in such a manner as to preserve access to any existing equipment or to any new equipment installed under this specification or under other specifications or contracts for this building and with sufficient space provided for proper operation and maintenance.
E. The drawings are generally indicative of the work to be installed but do not indicate all bends, fittings, boxes, mounting hardware, etc. which may be required. Contractor shall carefully investigate the structural and finish conditions affecting his work, arrange his work accordingly, and furnish such fittings as may be required to meet such conditions.
F. This Contractor shall coordinate his work with that of other trades so that all work may be installed in the most direct manner and so that interference between piping, ducts, equipment, architectural, or structural features will be avoided, In the instance where interference between the work of two or more contractors results, the Architect shall decide which work is to be relocated. The Architect may decide to move a contractor's work regardless of which is work first installed. Such relocation shall be at no additional cost to the Owner.
G. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building construction where required.
H. All items of labor, material and equipment not specified in detail or shown on the drawings but incidental to, or necessary for, the complete and proper installation and proper operation of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for detail by the specifications or drawings.
I. Major items of equipment shall be the best grade and quality used for the propose in commercial practice and shall have the manufacture's name, address and catalog number on a plate securely affixed in a prominent place. All equipment or apparatus of any one system must be the product one manufacturer, or equivalent products of a number of manufactures, which are suitable for use in a total system solution.
J. When available, all materials and equipment shall bear the label of approval of the Underwriters' Laboratory, Inc.

1.16 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original factory wrappings and containers, clearly, labeled with identification of manufacturer. Inspect equipment to ensure that no damage has occurred during shipment. Do not install damaged equipment, remove from site and replace damaged equipment with new.

B. Store materials in original packages and containers, inside a well-ventilated area protected form weather, damaging fumes, construction debris, moisture, soiling, extreme temperatures or humidity; laid flat and blocked off ground to prevent sagging and warping or damage due to traffic. Comply with instructions and recommendations of manufacturer for special delivery, storage and handling requirements. Any equipment returned or exchanged will be in the original container. Any loss due to improper storage, handling or inadequate packaging will be sole liability of the Contractor.

1.17 SCAFFOLDING/LIFTS/ LADDERS

A. The Telecommunications Contractor shall furnish and erect all scaffolding, lifts and ladders required in performance of their work.

1.18 CLEAN-UP

A. Upon completion of the work and/or when directed by the Architect/Engineer, this Contractor, shall remove all dirt, foreign materials, stains, fingerprints, etc. from all fixtures, panels, plates , etc. installed under this project, and shall leave the site is such a condition that no cleaning by the Owner is required. Internal areas of all equipment must be cleaned of all construction dust, etc. prior to pre final inspection and final inspection and or final inspection.
B. Daily and at the completion of the work contemplated under these Specifications, the Contractor shall remove from the building site and construction areas, all rubbish and accumulated materials of whatever nature not caused by other trades, and shall leave the work in a clean, orderly and acceptable condition at all times.

1.19 PROTECTION OF WORK, MATERIALS, AND EQUIPMENT

A. This Contractor shall effectually protect, at his own expense, all existing facilities and such of his new work, materials or equipment as are liable to injury during the construction period. All openings into any part of the conduit system as well as all associated fixtures, equipment, etc. both before and after being set in place, must be securely covered or otherwise protected to prevent obstruction, damage, or injury due to carelessly or maliciously dropped tools or materials, grit, dirt, moisture water or any foreign matter. This Contractor shall be held responsible for all damage so done, until his work is fully accepted by the Owner.
B. All surfaces, either finished, in preparation for finishing or with finish material applied, shall be protected against damage from welding, cutting, burning, soldering, or similar construction functions. The protection shall be accomplished by care in operations, covering and shielding. Special care shall be directed to exposed finished masonry, metal or wood surfaces and painted surfaces. Any damage, which does occur to surfaces, shall immediately be brought to the attention of the Architect, Engineer, and the Owner. The required corrective measures shall be accomplished by the trade that made the original installation, when and as directed by the Architect, at the expense of the Contractor causing the damage, and at no cost to the Owner.
C. Any damage caused by neglect on the part of this Contractor his representative, or by the elements due to neglect on the part of the Contractor or his representative, either to

the existing work, or to his work or to the work of any other Contractor, shall be repaired at his expense to the Architect's satisfaction

1.20 PROTECTION OF SERVICE AND EQUIPMENT

A. The Contractor shall, at his own expense, repair, replace and maintain in service any utilities, facilities or service (underground, over-ground, interior or exterior) damaged, broken, or otherwise rendered inoperative during the course of construction by him or his representatives. The method used by the Contractor is repairing, replacing or maintaining the services shall be approved by the Architect.

PART 2- PRODUCTS – Not Used
PART 3 – EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

END OF SECTION 270790

APPENDIX A
TELECOMMUNICATIONS CONTRACTOR QUALIFICATIONS Cat 6e.

A. In order to qualify for installation of the data/voice communications systems, the Contractor must
have a performance history, experience in the installation and termination of optical fiber cable systems, experience in the installation and termination of low voltage data/voice cable systems, experience in furnishing and installing data network systems, and proof of time in business. Contractor must be trained and certified for the communications cable and hardware which it installs, and must furnish proof of certification

B. PERFORMANCE HISTORY: Contractor must have successfully performed at least three projects of similar scope within three years of the data of this bid. Proof of performance shall be in the form of reference sheets which shall include a brief description of the project, the beginning and ending contract price, the project foreman or superintendent's name, and the name, address, and telephone number of the owner of the reference.
   1. The project references must include three network installation of a least 250 drops and must have been completed within three years of the date of this bid.
   2. The three network project reference shall show having installed multiple Ethernet drops termination, connections, wiring closets, and active network devices within the last 36 months.

C. OPTICAL FIBER EXPERIENCE: Contractor must be able to prove to the satisfaction of the Owner that it has significant experience in the installation of optical fiber cable systems. Installation must include installation of optical fiber termination a knowledge of interconnect equipment, and a thorough knowledge of testing procedures. Contractor must provide a minimum of 3 reference supporting its claim of experience for similar projects with 3 years prior to this bid. Documentation must be included with the documents submitted.

D. TIME IN BUSINESS: Contractor must have been in business and in the business of installing telecommunications systems continuously for a period of at least three years prior to the data of this bid. Contractor must submit at least one project reference for each of the three years prior to the date of this bid. These project reference shall contain the same information required in Paragraph A above. Contractor must also provide a list of key installation personnel hire dates and a resume of their experience. Key installation personnel shall include at least one foreman and three journey level installers or technicians. By submitting the names of these personnel, the contractor is committing them to the execution of the project outlined in this specification. The Contractor shall submit certificates of completion for all key installation personnel that show evidence in certification installing enhance category 6e wiring/termination and show evidence in certification of testing and installing enhance category 6e horizontal channels to the EIA/TIA testing standards. "Category 6e installation/testing certifications shall be by BICS (Building Industry Consulting Services Institute), or a BICSI approve or endorsed training program, or equivalent manufacturer's training. All Sub-contractors must also have been in business for a period of least three years prior to the date of this bid and submit evidence indicating such.

E. The Contractor shall provide satisfactory evidence of a fully equipped service organization, capable of furnishing adequate inspection and service to the system, including standard replacement parts, within 100 miles of the project site. The address and phone number of the service organization shall be included in the bid response.
F. The qualified Contractor shall perform all data/voice and terminations at the outlets, IDFs, and MDF location
G. HARDWARE CERTIFICATION: The Contractor and/or Sub-Contractor shall be authorized by the listed/provided Wiring/Termination Supplier, and to market, support, install, and service all hardware proposed to be furnished. Letters of Supply and Proof of Authorization/Certification shall be included with the bid response.
    1. The Contractor, or his Sub Contractor, must be “certified” to install the “Leviton”, “Ortronics”, “Hubbell”, or Engineer pre-approved Cabling system.

END OF SECTIN 26 4960

SECTION 27 1100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications service entrance pathways.
4. Grounding.

B. Related Sections:

1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
2. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies, and location and size of each field connection.
2. Equipment racks and cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as Commercial Installer, Level 2 to perform the on-site inspection.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.5 COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
2. Support brackets with cable tie slots for fastening cable ties to brackets.
3. Lacing bars, spools, J-hooks, and D-rings.
4. Straps and other devices.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used].

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches Comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

2.3 GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with ANSI-J-STD-607-A.

2.4 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.

3.3 Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems."

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.4 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping. "Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems. "Comply with requirements in Division 09 Section "Interior Painting" for painting backb" Comply For fire-resistant plywood, do not paint over manufacturer's label.

B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration including optional identification requirements of this standard.

C. Labels shall be preprinted or computer-printed type.

END OF SECTION 27 1100

SECTION 27 1300 - COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mulit-mode (OM3) optical fiber cabling.
2. UTP Backbone Cabling
3. Cable connecting hardware, patch panels, and cross-connects.
4. Cabling identification products.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. IDC: Insulation displacement connector.

D. LAN: Local area network.

E. RCDD: Registered Communications Distribution Designer.

F. UTP: Unshielded twisted pair.

1.4 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross- connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards inTIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.7 INFORMATIONAL

SUBMITTALS

A. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.

1.10 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 FIBER DISTRIBUTION CABLE

A. Fiber Characteristics:

1. All fibers in the cable must be usable fibers and meet required specifications.
2. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.
3. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding.
4. The coating shall be a dual layered, UV cured acrylate applied by the fiber manufacturer.
5. The coating shall be mechanically or chemically strippable without damaging the fiber.
6. Optical fibers shall be placed inside loose buffer tube(s). Fiber tube(s) shall be placed in plenum rated outer sheath. Each outer sheath shall contain up to maximum twenty-four (24) multi mode fiber strands and six (6) single mode fiber strands. Refer to drawings or Network Riser Diagram for actual quantities of strands.
8. Cable shall comply with UL 1666 Specifications.
9. Each fiber shall be distinguishable from others by means of color coding.
10. These colors shall meet EIA/TIA-598, "Color Coding of Fiber Optic Cables".
11. The maximum pulling tension hall be 2700 N (600 lbs.) during installation (short term) and 600 N (135 lbs.) long term installed.
12. The shipping, storage, and operating temperature range of the cable shall be -40° C. to + 70° C. The installation temperature range of the cable shall be 0° C. to +70° C. The operating temperature range of the cable shall be -40° C to + 70° C.

B. The multimode fiber utilized in the cable specified herein shall meet EIA/TIA-492AAAC-1989, "Detail Specification for 50 nm Core Diameter/125 nm Cladding Diameter Class Ia Multimode, Graded Index Optical Waveguide Fibers" suitable for 10 Gb/s at 300 meters.

1. Core diameter: 50 laser optimized or advanced + 3.0 nm
   a. Cladding diameter: 125.0 + 2.0 nm
   b. Core-to-Cladding Offset: <3.0 nm
2. Coating Diameter: 250 + 15 nm
3. Graded index
4. Numerical Aperture: 0.275 + 0.015 (Measured in accordance with FOTP-47)

C. The single-mode fiber utilized in the cable specified herein shall conform to the following specifications:

1. Typical Core Diameter: 8.3 nm
2. Cladding Diameter: 125.0 + 1.0 nm by fiber end measurement.
3. Core-to-Cladding Offset: < 1.0
4. Cladding Non-Circularity: < 2.0%Defined as [1-(min.cladding dia. + max. cladding dia.)] X 100

5. Coating Diameter: 250 + 15 nm
6. Attenuation Uniformity - No point discontinuity greater than 0.1 dB at either 1300 nm or 1550 nm
7. Attenuation at the Water Peak - The attenuation at 1383 + 3 nm shall not exceed 2.1 dB/km.
8. Cutoff Wavelength - The cabled fiber cutoff wavelength shall be < 1250 nm.
9. Mode-Field Diameter (Petermann II) 9.3 + 0.5 nm at 1300 nm 10.5 + 1.0 nm at 1550 nm
10. Zero Dispersion Wavelength - 1301.5 nms wavelength < 1321.5 nm
11. Zero Dispersion Slope (So) - < 0.092 ps/(nm 2. km)

D. Provide quantity of multi mode and single mode fibers as indicated on drawings.

2.2 GENERAL FIBER CABLE PERFORMANCE

A. The fiber optic cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with FOTP-82, "Fluid Penetration Test for Filled Fiber Optic Cable".

B. The cable shall exhibit no flow (drip or leak) at 80 deg. C. The weight of any compound that drips from the sample shall be less than 0.05 grams (0.002) ounce). A representative sample of cable shall be tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable". The test sample shall be prepared in accordance with method A.

C. The non-armored fiber optic cables shall withstand a compressive load of 220 N/cm applied uniformly over the length of the cable. The armored fiber optic cables shall withstand a compressive load of 440 N/cm applied uniformly over the length of the cable. The average increase in attenuation for the fibers shall be < 0.20 dB at 1300 nm (multimode) and < 0.10 dB at 1500 nm (single-mode) for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after load removal. Testing shall be in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cable," except that the load shall be applied at the rate of 3mm to 20 mm per minute and maintained for 10 minutes.

D. The cable shall be capable of withstanding 25 cycles of mechanical flexing at a rate of 30 + 1 cycles/minute. The average increase in attenuation for the fibers shall be < 0.20 dB at 1300 nm (multimode) and < 0.10 dB at 1550 nm (single-mode) at the completion of the test. For armored cables, any visible cracks causing separation of the armor and propagating more than 5 mm shall constitute failure. Outer cable jacket cracking or splitting observed under 10X magnification shall constitute failure. The test shall be conducted in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," except that the sheave diameter shall be a maximum diameter 0f 20X the cable OD. The cable shall be tested in accordance with Test Conditions I and III of the FOTP.

E. The cable shall withstand 25 impact cycles. The average increase in attenuation for the fibers shall be < 0.40 dB at 1300 nm (multimode) and < 0.20 dB at 1550 nm (single- mode). The cable jacket shall not exhibit evidence of cracking or splitting. The test shall be conducted in accordance with FOTP-25, "Impact Testing of Fiber Optic

Cables and Cable Assemblies".

F. The cable shall withstand a tensile load of 2700 N (600 lbs) without exhibiting an average increase in attenuation of greater than 0.20 dB (multimode) and 0.10 dB (single- mode). The test shall be conducted in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test", using a maximum mandrel and sheave diameter of 560 mm. The load shall be applied for one hour in Test Condition II of the FOTP.

G. The cable shall withstand a simulated lightning strike with a peak value of the current pulse > 105 kA. The test current used will be damped oscillatory with a maximum time- to-peak value of 15nm (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 30 kHz. The time to half-value of the waveform envelope (t1/2) will be from 40-70. The test shall be conducted in accordance with the proposed FOTP- 181, "lightning Damage Susceptibility Test for Optic Cables with Metallic Components". In addition to the analysis criterion set forth in FOTP-181, the integrity of the buffer tubes (or analogous loose tube, i.e. core tube) and strength members must be intact after removal of the cable specimens from the test box.

2.3 INTERCONNECT CENTERS

A. Provide fiber rack mount interconnect center panels, Hubbell FRP 3 SP, or equal, with recessed patch cord protection. The fiber rack mount panels shall have a minimum of three (3) adapter panels. Each adapter panel shall have a minimum of ten (10) ports. Each port shall have SC connector.

B. Interconnect center shall be compatible with SC compatible connectors.

C. Interconnect center shall provide ample room for feed through cables. Strain relieve provisions shall be provided for multiple cables within each unit. Labels shall be provided for jumper routing documentations.

D. Record each fiber identification on labels within each interconnect unit.

E. Interconnect shall be securely mounted to rack.

F. Contractor shall follow recommended manufacturer installation recommendations.

G. Interconnection unit shall be installed in enclosure that is UL Listed as impact resistant. Enclosure shall provide for inserts to enclose cable entry points to prevent dust or insect into enclosure.

H. Provide double duplex receptacle with transient voltage surge suppression, meeting UL1449, adjacent to rack.

2.4 FIBER SPLICING AND TERMINATING

A. Splice closures.

1. Splice closures shall provide strain relief of fiber cable. Strain relief shall

be provided by glass capillaries, heat shrink tubing or silicone sealant.

2. Splice closure shall provide for a splice tray or organizer inside of closure.

B. Fusion splicing.

1. All fiber splicing shall be fusion type splicing.
2. All fusion splicing shall be performed utilizing a microprocessor controlled fusion splicer.

C. Termination.

1. All termination shall be completed with the use of SC compatible connectors.
2. Factory connectorized pigtails shall be spliced to fibers by means of fusion splicing.

2.5 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA/EIA-568-B.1.

B. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568- B.3.

C. Cable will be considered defective if it does not pass tests and

inspections.

D. Prepare test and inspection reports.

1.1 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope Inc. brand.
11. 3M.

12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 25-pair UTP, formed into 25-pair binder groups covered with a gray thermoplastic jacket and overall metallic shield.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6e.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG[; or MPP, CMP, MPR, CMR, MP, or MPG].
b. Communications, Plenum Rated: Type CMP[or MPP], complying with NFPA 262.
c. Communications, Riser Rated: Type CMR[; or MPP, CMP, or MPR], complying with UL 1666.
d. Communications, Limited Purpose: Type CMX[; or MPP, CMP, MPR, CMR, MP, MPG, CM, or CMG].
e. Multipurpose: Type MP or MPG[; or MPP or MPR].
f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
g. Multipurpose, Riser Rated: Type MPR[or MPP], complying with UL 1666.

1.2 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: rack mounted 110-style IDC for Category 6e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criterial.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, 4-pair cables in 48-inch lengths; terminated with 8-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within data racks. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 260533"Raceway and Boxes for Electrical Systems."

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

D. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Administration Class: 4.

2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 4 level of administration.

C. Comply with requirements in Section 271500 "Communications Horizontal Cabling" for cable and asset management software.

D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

F. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet .
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

   a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building- mounted device with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568- B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Backbone link measurements: Test according to TIA/EIA-526-14-A, Method B, One Reference Jumper.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 27 1300

SECTION 27 1500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cabling.
3. Multiuser telecommunications outlet assemblies.
4. Emergency Notification System ‘ENS’
5. Cable connecting hardware, patch panels, and cross-connects.
6. Telecommunications outlet/connectors.
7. Cabling identification products.
8. Cabling administration system

B. Related Sections:

1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.

1.2 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more that one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Cross-connects.
    b. Patch panels.
    c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.

D. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

E. Source quality-control reports.

F. Field quality-control reports.

G. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings , Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 450 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

E. Grounding: Comply with ANSI-J-STD-607-A.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches Comply with requirements in Division 06 Section "Rough Carpentry" for plywood backing panels.

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.

8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M.
12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6E.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, General Purpose: Type CM
    b. Communications, Plenum Rated: Type CMP or MPP, complying with NFPA 262.
    c. Communications, Riser Rated: Type CMR; or MPP, CMP, or MPR, complying with UL 1666.
    d. Communications, Limited Purpose: Type CMX
    e. Multipurpose: Type MP.
    f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    g. Multipurpose, Riser Rated: Type MPR or MPP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6e performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

2.5 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY (MUTOA)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.
2. Hubbell Premise Wiring.
3. Molex Premise Networks; a division of Molex, Inc.
4. Nordex/CDT; a subsidiary of Cable Design Technologies.
5. Ortronics, Inc.
6. Panduit Corp.
7. Siemon Co. (The).

B. Description: MUTOAs shall meet the requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:

a. One for each four-pair UTP cable indicated.
b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.

3. Mounting: Recessed in ceiling Wall Desk Furniture.
4. NRTL listed as complying with UL 50 and UL 1863.
5. Label shall include maximum length of work area cords, based on TIA/EIA-568-B.1.

When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.6 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Four port-connector assemblies mounted in single or multigang faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
2. Metal Faceplate: Stainless steel complying with requirements in Division 26 Section "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of UTP work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

4. Legend: Factory labeled by silk-screening or engraving for stainless steel faceplates.
5. Legend: Machine printed, in the field, using adhesive-tape label.
6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.7 WIRELESS ACCESS POINT CABLE

A. All wireless access point cables shall be Category 6E, 24awg solid copper, four pair, twisted, unshielded plenum rated with blue overall jacket and an RJ 45(8P8C) clear terminal connector. RJ45 terminal connectors to be certified by cable and/or connector manufacturer to work with cabling supplied. RJ45 to be labeled per 1.3.D.1, except label to be applied to cable 6” from RJ45.

B. Wiring shall be installed using TIA/EIA 568B methods and shall conform to 802.3 and 802.5 specifications.

C. All wiring shall be UL listed for conformance to the National Electrical Code.

D. All cables shall be single piece, outlet to patch panel. No splice shall be permitted.

2.8 PATCH PANELS

A. Provide sufficient 24 or 48 port Category 6E patch panels to accept all outlet cables and to allow 30% spare capacity in MDF and each IDF room. Patch panels to be mounted in racks or cabinets as required. Each port to be labeled with room number/location of jack/plug at other end.

B. All ports on patch panels to be labeled indicating jack number and room number of corresponding field jack/RJ45. ENS ports to be green in color. All others may be factory

color as long as not green.

C. Provide three (3) spare 24-port rack mountable Category 6E patch panels. Deliver to owner.

D. Provide all necessary mounting and wire management hardware.

2.9 EQUIPMENT RACKS AND ENCLOSURES

A. Provide 19” X 84” aluminum racks with mounting hardware. Racks shall have 15” X 21” base with (4) ¾” holes for floor mounting. Mount solidly to floor. Where rack will have no/limited rear access due to size of network closet, provide industrial quality casters on rack so rack can be rolled out of closet allowing access to rear. Allow enough slack in wiring to accommodate. Owner’s standard.

B. Provide all necessary mounting and side rack wire management hardware.

2.10 GROUNDING

C. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

D. Comply with ANSI-J-STD-607-A.

2.11 IDENTIFICATION PRODUCTS

E. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

F. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.12 SOURCE QUALITY CONTROL

G. Testing Agency: Engage a qualified testing agency to evaluate cables.

H. Factory test UTP cables on reels according to TIA/EIA-568-B.1.

I. Factory test UTP cables according to TIA/EIA-568-B.2.

J. Cable will be considered defective if it does not pass tests and inspections.

K. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.3 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.4 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.5 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.

13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches .
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches .
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches .

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches .

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches .

3.6 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.7 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.8 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Administration Class: 1 2.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.

D. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

F. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet .
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance

with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.

2. Visually confirm Category 5e, Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
    b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. Prepare test and inspection reports.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 27 1500

SECTION 280760 - FIRE ALARM AND DETECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The General Provisions of Contract, including General and Supplementary Conditions and other General Requirements sections, apply to the work specified in this section.

1.2 WORK DESCRIPTION:

A. Provide an Edwards (Basis of Design) Addressable Fire Alarm Master Controller as shown on the Drawings or an approved equivalent product in accordance with the attached Construction Bid Drawings and Specifications.

B. The system shall include new devices in accordance with the project drawings consisting of new controls, pull stations, smoke/heat/duct sensors, annunciator panel, audio visible units, visible only units and any other appurtenances necessary for complete and operational system.

C. The complete installation is to conform to the applicable sections of the current IBC, NFPA-72, NFPA-70 (with particular attention to Article 760), and any other locally enforced requirements of the Authority Having Jurisdiction.

1.3 QUALITY ASSURANCE:

A. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the UJOZ category by Underwriters Laboratories, Inc. (UL), and shall bear the "U.L." label. Partial listing shall NOT be acceptable.

B. The catalog numbers specified under this section are those of Edwards – EST by UTC and constitute the type, product quality, material, and designed operating features.

1.4 SHOP DRAWINGS:

A. The contractor shall submit a package which is sufficiently detailed to show that the proposed system meets the specifications. The package shall contain the following:

1. Catalog cuts of components, including system cabinets with physical dimensions.
2. Circuited Floor Plans showing the types and arrangement of connections among the components, including cable types.

3. Tabulations verifying the extra capacity required below. Show tabulations for points, power supplies, and battery standby.
4. Without these, the package will be rejected without review.

1.5 WARRANTY:

A. The Contractor shall guarantee the system to perform as specified and be free from defects in materials and workmanship for one year from date of Owner acceptance. Any repairs during this time are to be provided by the Contractor during normal working hours at no cost to the Owner.

1.6 OPERATION:

A. The actuation of any alarm initiating device such as a manual pull station, fire sensor or sprinkler flow switch shall cause the following to occur:

1. Sound all audible and visual alarm signals until manually acknowledged and reset.
2. Display the device in alarm label at the control panel.
3. Display the device in alarm label at the annunciator panel if supplied.
4. Transmit the alarm to an approved supervising station via internal DACT or Alarm Relay Module.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Edwards Systems Technologies 'EST' or comparable product by one of the following:

1. GE Infrastructure; a unit of General Electric Company.
2. NOTIFIER; a Honeywell company.
3. Siemens Building Technologies, Inc.; Fire Safety Division.
4. Silent Knight; a Honeywell company.
5. SimplexGrinnell LP; JCI.

2.2 MAIN PANEL:

A. Fire Alarm Master Controller CPU: Supply Fire Alarm Controls adding additional modules and enclosures as necessary. At a minimum provide and power as noted the following in quantities necessary to complete the project:

1. Edwards UTC Addressable Fire Control Panel
2. Related Support Modules as appropriate.
3. Correctly sized Batteries – Quantity 2

2.3 SYSTEM COMPONENTS

A. Both Initiating and Notification material supplied shall be specified as “Fire Alarm Only” supply notification appliances labeled FIRE as opposed to ALERT.

B. Edwards Genesis Series Horn/Strobe: G1-HDVM Horn/Strobe for Wall Mount and GC-HDVM for Ceiling Mount

1. White housing with a clear lens, wall-mount or ceiling-mount
2. Fully synchronized per ADA and UL Standard 1971
3. Strobe intensity shall be as indicated or required by the application (15/ 30/75/110/cd)
4. Surface-mount adapters where required (27193-11)

C. Edwards Genesis Series Visual Alarm: G1-VM Strobe-only for Wall Mount and GC-VM for Ceiling Mount

1. White housing with a clear lens, wall-mount or ceiling mount
2. Fully synchronized per ADA and UL Standard 1971
3. Strobe intensity shall be as indicated or required by the application (15/ 30/75/110 cd))
4. Surface-mount adapters where required (27193-11)

D. Edwards Signature Series Addressable Pull Station for ADA approved operation; SIGA-278

1. Double-action operation with ADA approved pull-to-operate actuation mechanism
2. Red Lexan housing with clearly visible operating instructions provided on the cover. The words FIRE ALARM shall appear on the front in white letters
3. Key operated test-reset lock designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
4. Surface Mount supply Box (276B-RSB)

E. Detection Devices – General

1. Sensors shall include analog sensing and addressable communication, and shall connect to the fire alarm control panel's Signaling Line Circuits.
2. Sensors shall mount to the same addressable base which includes a status indicator LED.
3. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system.
4. The sensors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature. Provide surface-mount adapter plate where required.
5. The sensors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.

F. Edwards Signature Series Smoke Sensor (Photoelectric): SIGA-PD

1. Shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

2. Supply Standard Edwards Detector Base with Trim Skirt: SIGA-SB4

G. Edwards Signature Series Heat Sensor (Thermal): SIGA-HFD

1. Thermal detectors shall be intelligent addressable devices rated to operate at 135 degrees Fahrenheit.

2. Supply Standard Edwards Detector Base with Trim Skirt: SIGA-SB4

H. Edwards Signature Series Duct Smoke Sensor Configuration: SIGA-SD addressable detector, SIGA-CR addressable control relay, SD-TRK remote test/rest keyed station and a SD-T78 sampling tube

1. Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.
2. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single “Form C” contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Mount relay within 3 feet of HVAC control circuit.
3. Duct Housing shall have a transparent cover to monitor for the presence of smoke and a relay control trouble indicator Yellow LED and Red sensor status LED.
4. Duct Housing shall include two (2) Test Ports for measuring airflow and for testing. .
5. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to shutdown associated air handling system.
6. Each duct detector shall have a Remote Test Station with an alarm LED and test switch located where indicated.

I. Edwards Signature Series Addressable (Monitor) Module; SIGA-CT1 (single point) or SIGA-CT2 (dual point)

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
2. The monitor module shall mount in a standard single-gang electrical box. Provide mounting bracket and cover plate with LED view port
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

J. Edwards Signature Series Addressable Relay (Control) Module; SIGA-CR

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

2. The control module shall mount in a standard single-gang electrical box, or to a surface mounted backbox.

K. Edwards Remote Annunciator Panel; RLCD-C

2.2 BATTERIES AND EXTERNAL CHARGER

A. Battery; Yuasa Brand

1. Shall be 12 volt, Sealed Lead acid type.
2. Shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 4 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free.

2.4 SPARE DEVICES; Edwards

A. Provide the spare devices listed below in addition to all quantity of devices indicated on drawings. Deliver devices to Owner at conclusion of project.

1. One (1) sensor of each type
2. One (1) sensor base of each type
3. One (1) manual pull station of each type
4. One (1) interface module
5. One (1) control module
6. One (1) visual device

B. Extra material to be stored in a manufacturer approved and supplied spare parts kit. The enclosure shall be of adequate interior volume, be clearly labeled as to contents, and installed by the contractor in a readily accessible location for routine service activities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NFPA 72, local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer.

B. Device Mounting: All fire detection and alarm system devices, control panels and remote annunciators shall be installed as follows:

1. Accessible ceilings (lay-in ceilings or suspended drywall or similar construction)
   a. flush mounted devices with recessed box and concealed wiring/conduit
2. Inaccessible ceilings (exposed 'open' structure or inaccessible ceilings)
   a. unfinished spaces; surface mounted devices using exposed conduit and boxes
   b. finished spaces; surface mounted devices using surface raceway
3. Hollow walls (stud walls or hollow CMU)
   a. flush mounted devices with recessed box and concealed wiring in conduit
   b. surface devices with exposed conduit may be used only in unfinished spaces (mechanical / electrical rooms or similar areas).
4. Solid walls (solid masonry)
   a. surface mounted devices with surface raceway system
      1) exposed conduit may be used only in unfinished spaces (mechanical / electrical rooms or similar areas).

3.2 WIRING METHODS

A. General: All fire alarm system wiring shall be installed concealed wherever possible.

1. Install wiring in cable tray where indicated. Use an approved cable support system attached directly to structure elsewhere.
2. No wiring shall lie directly on ceilings. No wiring shall be strapped or tied to piping, ductwork or conduits.
3. In open structure areas (rooms without ceilings) install wiring in conduit.

B. Conduit and Raceway:

1. Conduit shall be electrical metallic tubing, ¾" minimum, with fittings and boxes.
2. All conduit and junction boxes shall be concealed in finished areas and may be exposed in unfinished areas or areas without ceilings.
3. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer
4. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
5. All conduit, mounting boxes, junction boxes and panels are to be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system.
6. Fire alarm cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29. Wiring

for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

7. Conduit sleeves with fire-stopping shall be provided where open wiring penetrates floors or fire-rated partitions.

C. Wiring:

1. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system.
2. All fire alarm system wiring and cables must be new and be color-coded red
3. Number and size of conductors or cables shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and signaling line circuits, and 14 AWG for notification appliance circuits.
4. Wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
5. Wire and cable not installed in conduit shall have a plenum-rated fire resistance rating as indicated in NFPA 70 (e.g., FPLR).
6. Conductors in conduit shall be type THHN or THWN insulated as specified in other Section 260519,
7. Wire and Cable shall be as recommended by the equipment manufacturer and approved for use as a Fire Alarm Cable by the National Fire Code and the local authority. Where exposed all circuits shall be enclosed in EMT or better. Installation shall follow Section 16100.
8. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This panel circuit breaker shall be labeled as FIRE ALARM in “RED” and be provided with a “RED” Circuit Breaker Lock, Garvin UBL2 or equivalent. The control panel shall be grounded using a #10 AWG conductor.
9. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
10. All field wiring shall be electrically supervised for open circuit and ground fault.
11. All conductors and cables shall be installed without the use of splices unless permitted by the manufacturer.
12. Cable lubricants shall be used only as permitted by the manufacturer.
13. Flexible connectors are to be used for all devices mounted in suspended lay-in ceiling panels.
14. No wiring other than fire alarm detection, alarm or auxiliary functions will be permitted in fire alarm raceways.

D. Terminal Boxes, Junction Boxes and Cabinets

1. All boxes and cabinets shall be factory painted red and UL listed for their use and purpose. Suppliers of such material include Arlington Industries, Bridgeport, Garvin, and Space Age Electronics.

E. The contractor shall supply one Category VI Cables between the customer's primary network service switch and the FACP to support IP Based Remote Service Monitoring and Reporting. Cables shall be certified to meet the ANSI/TIA -568-B.2-1 Standard for Gigabit Ethernet. Only 22 or 23 AWG copper shall be allowed.

3.3 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Equipment Mounting: Install fire-alarm control unit on utility strut to provide an air-space from the wall surface if mounting on an exterior masonry wall.

1. Install seismic bracing. Comply with requirements of "Vibration and Seismic Controls for Electrical Systems."
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (460-mm) centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install fire-alarm control unit on finished floor.

1. Comply with requirements for seismic-restraint devices specified in "Vibration and Seismic Controls for Electrical Systems."

D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in "Vibration and Seismic Controls for Electrical Systems."

E. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

F. Smoke-or-Heat Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Revise first subparagraph below to indicate how Contractor shall determine detector spacing.
4. Smooth ceiling spacing shall not exceed 30 foot spacing.
5. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to NFPA 72.
6. See Editing Instruction No. 10 in the Evaluations for discussion about placement of smoke detectors near HVAC air inlets and outlets.
7. HVAC: Locate detectors not closer than 36 inches (910 mm) from air-supply diffuser or return-air opening.
8. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
9. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

2. Duct Smoke Detector shall be equipped with Remote Test Switches. Test Switches shall be installed in the ceiling below the Roof Top Unit they support if applicable.

H. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.

I. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in elevator shafts, unless the shaft is protected by an Automatic Sprinkler System installed in accordance with NFPA 13.

J. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

K. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

L. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes. Install all devices at the same height unless otherwise indicated.

M. Visible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install such that the center line of the Visible Alarm Device is 80" above the finished floor surface. Install all devices at the same height unless otherwise indicated.

N. Alarm Network Communications:

1. Digital Alarm Communicator and TCP/IP communications cable as specified in 2.3 J. 2. & 4. shall be Category 6 Plenum Rated Type. Cables shall be certified to meet the ANSI/TIA -568-B.2-1 Standard for Gigabit Ethernet. Only 22 or 23 AWG copper shall be allowed. Work shall be completed in conformance with accepted Voice and Data installation practices.

O. Identification:

1. All wiring shall be identified at the FACP and at each terminal and junction box. Each conductor and cabinet terminal must be numbered and coded. All conductors in conduit pull boxes or cabinets containing more than one wire must be labeled on each end with machine printed on flexible high adhesion vinyl tape.
2. Wiring color codes must be used throughout. Transposing or changing color coding of wires will not be permitted.
3. Junction boxes shall be painted fire red and identified with 'FA' on cover. Suppliers of such material include Arlington Industries, Bridgeport, Garvin, and Space Age Electronics.

P. Smoke detectors and pull stations shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect devices from contamination and physical damage

3.4 COORDINATION

A. Coordinate with all other trades in submittal of shop drawings. Shop drawings shall detail space conditions to the satisfaction of all concerned trades, subject to final review by the architect or project manager whichever is applicable. If installation of equipment, raceways, cable trays and/or conduit is performed prior to coordination with other trades, which interferes with work of other trades, make necessary changes to correct the condition at no additional cost to the owner.

B. Maintain all existing equipment and systems in operation until new equipment and systems are installed, tested and made operational as required, to follow phasing of construction.

C. Coordinate and disconnect existing electronic/electrical equipment, services and/or controls to items being removed.

3.5 TEST

A. Provide the service of a competent, factory-trained project manager NICET Level IV and technician NICET Level II minimum authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open and ground initiating device and signaling line circuits and verify that the trouble signal actuates.
5. Check presence and audibility of tone and voice message at all alarm notification devices.
6. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
7. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
8. Test optional features based on the manufacturer's instructions.

B. After certification of completion and operation of the system, the entire system shall be retested by the manufacturer’s representative in the presence of a representative of the owner and the Authority Having Jurisdiction, and a test report per NFPA 72, shall be made out, in triplicate, and signed by the owner’s representative, indicating that they witnessed the actual test of the system.

3.6 FINAL INSPECTION

A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.7 INSTRUCTIONS

A. Furnish the services of a field representative who shall have specialized experience in the operation and maintenance of the systems and shall instruct the owner's personnel in the techniques involved in the operation of the systems.

B. Formal on-site training shall be provided to the owner's representative/maintenance personnel and shall include instructions in the location, inspection, maintenance, testing and operation of all electronic components.

C. Provide minimum of (4) hours of general instruction. Provide a signed copy of the name of the personnel giving the instructions and the personnel of the owner who were instructed.

END OF SECTION 280760

SECTION 28 1300 - Combined Access Control & Intrusion Detection System

Performance-Based Specification – DMP (Digital Monitoring Products)

Alternate Manufacturer – Brivo – Avigilon – Bosch, or Approved Equal

1. General requirements

Provide a complete integrated electronic access control and intrusion detection system using DMP equipment.

The system shall provide centralized management of building access, intrusion detection, alarm monitoring and security event reporting.

The installation shall include all necessary control panels, modules, readers, credentials, detection devices, door hardware interfaces, power supplies, batteries, software and accessories required for a complete operational system.

Contact Sciens Eastern Time Division - Zach Davies for pricing. Zdavies@sciensusa.com 484-707-3994

2. Access control requirements

The access control system shall provide:

- DMP access control panels and compatible door controllers.
- Proximity card readers or approved credential readers.
- Access cards, key fobs or other approved credentials. (provide 50 keyfobs on project)
- Individual user access permissions.
- Time-based access schedules.
- Door forced-open and held-open alarms.
- Lost or stolen credential deactivation.
- Event logging and reporting.

3. Intrusion detection requirements

The intrusion detection system shall include DMP-compatible equipment and provide:

- Intrusion detection control panels.
- Door and window contacts.
- Passive infrared (PIR) motion detectors.
- Internal and external audible alarm devices.
- Keypads for system operation.

- Area and zone configuration.
- Arming and disarming schedules.
- Alarm event reporting.
- Tamper monitoring of security devices.

4. System management and software

The system shall use compatible DMP management software and provide centralized administration of access control and intrusion detection functions.

Minimum functionality shall include:

- Centralized system management.
- User and credential management.
- Access level and schedule configuration.
- Intrusion alarm monitoring.
- Alarm event notifications.
- Access and alarm history reporting.
- Remote system administration for authorized users.
- Individual user permissions and audit trails.

5. Network and power requirements

- Provide secure network communications.
- Provide appropriately sized power supplies.
- Provide battery backup for security control equipment.
- Monitor power supply and battery faults.
- Provide supervised communications where supported.
- Ensure all equipment is protected against unauthorized access.
- Provide suitable communications redundancy where required.

6. Integration and life safety

The access control and intrusion detection systems shall operate as an integrated security solution.

The system shall provide:

- Integration between access control and intrusion detection.

- Automatic disarming of designated intrusion areas using authorized credentials, where required.
- Door status and alarm monitoring.
- Fire alarm interface where required.
- Emergency door release functionality.

All emergency egress and fire alarm interfaces shall comply with applicable building and fire codes.

7. Installation and commissioning

The contractor shall:

- Supply and install all DMP equipment.
- Install and configure all access control and intrusion detection devices.
- Configure access permissions, schedules and alarm zones.
- Test all controlled doors and locking hardware.
- Test intrusion detection devices and alarm functions.
- Verify fire alarm and emergency release interfaces.
- Demonstrate system operation to the client.

8. Handover documentation

The contractor shall provide:

- As-built security system drawings.
- Door and hardware schedules.
- Intrusion detection device and zone schedules.
- Equipment datasheets.
- System configuration details.
- User and administrator manuals.
- Operator training.
- Warranty and manufacturer support information.

SECTION 28 2300 - CCTV System – Basic Performance Specification

Video Management System: Hanwha WAVE/BLAZE or Approved Equal

Camera Manufacturer: Hanwha Vision or Approved Equal

1. General requirements- BASIS of DESIGN

Provide a complete IP CCTV surveillance system comprising Hanwha Vision IP cameras, Hanwha WAVE/BLAZE VMS, recording servers, storage, network switches and all necessary accessories.

The system shall provide 24/7 live monitoring, video recording, playback and video export.

Contact Sciens Eastern Time Division - Zach Davies for pricing. Zdavies@sciensusa.com 484-707-3994

2. Cameras –

All cameras shall be Hanwha Vision IP cameras and meet the following minimum requirements:

- Minimum 4MP resolution.
- Minimum 25 FPS.
- H.264/H.265 video compression.
- True WDR, minimum 120 dB where required.
- Day/night functionality.
- Infrared illumination where required.
- Motion detection.
- PoE network connectivity.
- IP66/IP67 protection for external cameras.
- IK10 vandal resistance where required.

Camera types shall include dome, bullet and PTZ cameras as required by the application.

Alternate Manufacturers: Axis – Avigilon or Approved Equal

3. Video Management System

The CCTV system shall use Hanwha WAVE/BLAZE VMS or Approved Equal.

The system shall provide:

- Live viewing of all cameras.
- Continuous and event-based recording.
- Video playback and search.

- Video export.
- User access control.
- Remote viewing for authorized users.
- Camera offline and system fault notifications.
- Centralized system management.

Alternate Manufacturers: Genetec, Milestone, Avigilon, or Approved Equal.

4. Recording and storage

- Provide a minimum of 30 days video retention.
- Record cameras at their specified resolution and frame rate.
- Provide sufficient storage capacity for all connected cameras.
- Provide RAID-protected storage.
- Ensure recording continues during normal system operation.

5. Network infrastructure

- Provide dedicated CCTV network infrastructure.
- Use managed PoE network switches.
- Provide sufficient network bandwidth for all cameras.
- Configure appropriate network security and access restrictions.

6. Installation and commissioning

The contractor shall:

- Supply and install all cameras and associated equipment.
- Configure all cameras and Hanwha WAVE software.
- Set up recording, playback and user permissions.
- Adjust cameras to achieve the required coverage.
- Test day and night camera performance.
- Demonstrate the completed system to the client.

7. Handover

Provide the following upon completion:

- As-built drawings.

- Camera schedule.
- Equipment datasheets.
- System configuration details.
- Operating manuals.
- User training.
- Warranty information.

SECTION 32 1216 – ASPHALT PAVING

Technical Specifications – 9.5 mm and 12.5 mm Superpave Asphalt Pavement
Below are typical technical specifications for **9.5 mm and 12.5 mm Superpave Hot Mix Asphalt (HMA)**, suitable for roadway construction, parking lots, access roads, and pavement rehabilitation.
Terminology clarification: The standard Superpave nominal maximum aggregate sizes (NMAS) are 9.5 mm (commonly called 9 mm) and 12.5 mm (commonly called 12 mm). These are aggregate sizes, not pavement thicknesses.
For projects in Northern Virginia, VDOT specifications are a useful reference. VDOT commonly identifies comparable surface mixtures as SM-9.5 and SM-12.5.

PAVEMENT EVALUATION AND DESIGN

1. General technical specifications

9.5 mm Superpave
Fine surface mix

Suitable for wearing courses and smoother surface finishes.

12.5 mm Superpave
Larger aggregate mix

Suitable for thicker surface courses and certain structural applications.

Parameter	9.5 mm Superpave	12.5 mm Superpave
Mix designation	SP-9.5	SP-12.5
Nominal maximum aggregate size	9.5 mm	12.5 mm
Maximum aggregate size	12.5 mm	19.0 mm
Mix type	Dense-graded HMA	Dense-graded HMA
Binder	Performance-graded asphalt	Performance-graded asphalt
Typical binder grade	PG 64-22	PG 64-22
Aggregate type	Crushed stone, gravel, sand	Crushed stone, gravel, sand
Mineral filler	Approved mineral filler	Approved mineral filler
Air voids at design	4.0%	4.0%
Typical application	Surface course	Surface or intermediate course

Binder grade is preliminary; select the actual PG grade based on climate, traffic, and governing agency requirements.

2. Aggregate gradation requirements

Aggregate gradation shall comply with the applicable Superpave mix design requirements and approved Job Mix Formula (JMF).

Typical control sieves include:

- 25.0 mm
- 19.0 mm
- 12.5 mm
- 9.5 mm
- 4.75 mm
- 2.36 mm
- 1.18 mm
- 0.600 mm
- 0.300 mm
- 0.150 mm
- 0.075 mm

The final percentage passing each sieve must be established by the approved mix design rather than assumed from the nominal aggregate size.

3. Typical mix design requirements

The mix design should be developed using the Superpave volumetric mix design procedure.

Parameter	Typical requirement
Design air voids (Va)	4.0%
Voids in mineral aggregate (VMA)	Minimum 14% for 9.5 mm; 14% for 12.5 mm
Voids filled with asphalt (VFA)	Generally 65–75%, depending on traffic level
Asphalt binder content	Determined by approved JMF
Aggregate angularity	As required by traffic level
Fine aggregate angularity	As required by traffic level
Moisture susceptibility	AASHTO T 283
Gyratory compaction	AASHTO T 312
Maximum theoretical specific gravity	AASHTO T 209
Bulk specific gravity	AASHTO T 166

These are preliminary design values. The governing agency's adopted AASHTO M 323 requirements and project traffic level control the final acceptance criteria.

4. Asphalt binder requirements

Parameter	Typical specification
Binder type	Performance-Graded (PG) asphalt
Typical binder grade	PG 64-22
High-temperature grade	64°C
Low-temperature grade	-22°C
Binder content	Approximately 4.5–6.5% by total mix weight
Binder source	Approved asphalt supplier
Binder standard	AASHTO M 320 or M 332

The actual binder content must be established through laboratory mix design. The PG grade should be adjusted for traffic loading and local pavement temperature requirements.

5. Pavement layer thickness

For typical VDOT surface mixtures, the following normal application rates are specified:

Parameter	9.5 mm surface mix	12.5 mm surface mix
Typical compacted thickness	1.5 inches (40 mm)	2 inches (50 mm)
Approximate application rate	165 lb/yd²	220 lb/yd²
Approximate application rate	90 kg/m²	125 kg/m²
Application	Surface course	Surface course

These are VDOT normal application rates, not universal minimum design thicknesses.

PAVEMENT EVALUATION AND DESIGN
+1

6. Construction and installation requirements

A. Surface preparation

- Remove dirt, loose material, and debris.
- Repair potholes and defective pavement areas.
- Ensure the underlying surface is dry and properly prepared.
- Apply an approved tack coat before asphalt placement where required.

B. Asphalt placement

- Deliver asphalt mixture at the approved mixing and placement temperatures.
- Use a mechanical asphalt paving machine.
- Maintain consistent paving speed and uniform material distribution.

- Avoid segregation during transportation, placement, and compaction.
- Maintain the required pavement thickness and finished elevations.

C. Compaction

- Compact asphalt using approved steel-wheel and pneumatic rollers, as appropriate.
- Perform initial, intermediate, and finish rolling.
- Achieve the density required by the governing specifications.
- Ensure uniform compaction throughout the pavement.
- Construct joints to prevent infiltration and premature pavement deterioration.

D. Surface finish

- Provide a uniform, smooth riding surface.
- Maintain proper longitudinal and transverse grades.
- Ensure proper drainage and eliminate surface depressions.
- Provide properly constructed longitudinal and transverse joints.

7. Applicable technical standards

Standard	Description
AASHTO M 323	Superpave Volumetric Mix Design
AASHTO R 35	Superpave Volumetric Design for Asphalt Mixtures
AASHTO M 320	Performance-Graded Asphalt Binder
AASHTO M 332	Performance-Graded Asphalt Binder Using MSCR
AASHTO T 166	Bulk Specific Gravity of Compacted Asphalt
AASHTO T 209	Theoretical Maximum Specific Gravity
AASHTO T 283	Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
AASHTO T 312	Preparing and Determining the Density of Asphalt Mixtures by Gyratory Compactor
ASTM D6927	Marshall Stability and Flow of Asphalt Mixtures

8. Typical construction drawing specifications

The following notes are incorporated into civil engineering drawings and project specifications.

For 9.5 mm Superpave asphalt:

1. Furnish and install 9.5 mm nominal maximum aggregate size Superpave hot mix asphalt.
2. Asphalt mixture shall be dense-graded and conform to AASHTO M 323 and applicable DOT specifications.
3. Asphalt binder shall be PG 64-22 or as specified in the approved Job Mix Formula.
4. Provide 4.0% design air voids.

5. Minimum VMA shall be 15%, subject to applicable mix design requirements.
6. Provide compacted pavement thickness of 1.5 inches unless otherwise indicated.
7. Apply approved tack coat to the prepared underlying surface.
8. Place, spread, and compact asphalt using approved paving equipment.
9. Achieve density in accordance with governing project specifications.
10. Provide a smooth, uniform finished surface with proper drainage.

For 12.5 mm Superpave asphalt:

1. Furnish and install 12.5 mm nominal maximum aggregate size Superpave hot mix asphalt.
2. Asphalt mixture shall be dense-graded and conform to AASHTO M 323 and applicable DOT specifications.
3. Asphalt binder shall be PG 64-22 or as specified in the approved Job Mix Formula.
4. Provide 4.0% design air voids.
5. Minimum VMA shall be 14%, subject to applicable mix design requirements.
6. Provide compacted pavement thickness of 2 inches unless otherwise indicated.
7. Apply approved tack coat to the prepared underlying surface.
8. Place, spread, and compact asphalt using approved paving equipment.
9. Achieve density in accordance with governing project specifications.
10. Provide a smooth, uniform finished surface with proper drainage.

SECTION 32 1313 – CONCRETE PAVING

Technical Specifications – Plain Concrete Sidewalk
Below is a typical construction specification for a **plain cement concrete (PCC) sidewalk**, suitable for residential, commercial, and general pedestrian applications.

The specifications are based on common U.S. construction practices and can be adapted to project drawings, local building codes, and municipal requirements.

1. General specifications

Item	Specification
Construction type	Plain concrete sidewalk (unreinforced)
Concrete thickness	4 inches minimum
Concrete strength	3,000–4,000 PSI at 28 days
Concrete type	Ready-mixed Portland cement concrete
Cement	ASTM C150 Type I/II or approved equivalent
Coarse aggregate	ASTM C33
Fine aggregate	ASTM C33
Maximum aggregate size	¾ inch
Water-cement ratio	0.50 maximum (recommended)
Slump	3–4 inches, unless mix design specifies otherwise
Air entrainment	5–7% where freeze-thaw exposure applies
Reinforcement	None for standard plain sidewalk, unless drawings require it
Surface finish	Medium broom finish
Color	Natural concrete gray

2. Subgrade preparation

- Excavate to the required depth and establish the sidewalk alignment and elevations.
- Remove organic material, loose soil, and unsuitable material.
- Compact the subgrade to at least 95% of maximum dry density (ASTM D698), unless project specifications require otherwise.
- Ensure the subgrade is uniformly graded and free from soft spots.
- Provide a minimum 4-inch compacted aggregate base where required by project conditions.

3. Concrete placement

- Place concrete uniformly within properly secured forms.
- Consolidate concrete without causing segregation.
- Strike off concrete to the required elevation.
- Provide a transverse slope of approximately 2% (¼ inch per foot) for drainage.
- Provide a minimum sidewalk width of 4 feet for typical pedestrian applications, subject to local requirements.

4. Joints

Joint type	Typical specification
Transverse contraction joints	Every 5 feet
Joint depth	Minimum ¼ of slab thickness
Expansion joints	At approximately 20–25 feet and at fixed structures, as required
Expansion joint material	½-inch preformed compressible filler
Isolation joints	Around buildings, columns, and other fixed structures

For a 4-inch slab, saw-cut or tooled contraction joints should generally be approximately 1 inch deep.

5. Finishing requirements

- Use a wood or magnesium float to achieve a uniform surface.
- Apply a light broom finish perpendicular to the direction of pedestrian travel.
- Tool all exposed edges with approximately ¼-inch radius.
- Avoid excessive steel troweling, which can create a slippery surface.
- Remove surface imperfections and ensure there are no ponding areas.

6. Curing and protection

- Apply an approved curing compound complying with ASTM C309, or use wet curing.
- Maintain curing for at least 7 days where wet curing is specified.
- Protect fresh concrete from rain, freezing temperatures, and premature drying.
- Prevent pedestrian traffic until the concrete has sufficiently hardened.
- Do not permit construction or vehicle traffic until adequate strength is achieved.

7. Applicable standards

Standard	Description
ACI 301	Specifications for Structural Concrete
ACI 302.1R	Guide for Concrete Floor and Slab Construction
ACI 308R	Guide to External Curing of Concrete
ASTM C94	Ready-Mixed Concrete
ASTM C150	Portland Cement
ASTM C33	Concrete Aggregates
ASTM C309	Liquid Membrane-Forming Curing Compounds
ASTM D698	Standard Proctor Compaction
ADA 2010 Standards	Accessible pedestrian routes
PROWAG	Public Right-of-Way Accessibility Guidelines

8. Typical sidewalk cross-section

Layer	Thickness
Plain concrete sidewalk	4 inches
Compacted aggregate base	4 inches (where specified)
Compacted subgrade	Prepared in place

SECTION 33 4100 - STORM UTILITY DRAINAGE PIPING (15-Inch HDPE Pipe)

Below is a typical technical specification for **15-inch High-Density Polyethylene (HDPE) pipe**, suitable for stormwater drainage, culverts, roadway drainage, and underground gravity-flow applications.

An important distinction is that 15-inch HDPE pipe is available in different configurations. For storm drainage, a common selection is corrugated HDPE pipe with a smooth interior and corrugated exterior.

1. General technical specifications
Recommended application: Underground storm drainage / gravity-flow system.

Item	Typical specification
Pipe material	High-Density Polyethylene (HDPE)
Nominal diameter	15 inches (375 mm)
Pipe configuration	Dual-wall corrugated
Interior surface	Smooth wall
Exterior surface	Corrugated wall
Material standard	ASTM D3350
Pipe standard	AASHTO M294, Type S
Installation standard	ASTM D2321
Joint type	Bell-and-spigot or approved coupling
Joint sealing	Rubber gasket where watertight joints are required
Typical pipe length	20 feet
Manning's roughness coefficient	Approximately 0.012
Color	Black exterior; interior may be black or other manufacturer standard
Application	Storm sewer, culvert, and drainage systems

Note: AASHTO M294 Type S is the typical specification for dual-wall corrugated HDPE storm drainage pipe. Type C refers to single-wall corrugated pipe. ASTM F2306 is another applicable standard for profile-wall HDPE drainage pipe.

2. Material requirements

- Pipe shall be manufactured from high-density polyethylene resin.
- Resin shall meet ASTM D3350 cell classification requirements.
- Pipe shall be resistant to corrosion, abrasion, and commonly encountered soil chemicals.
- Pipe shall be manufactured with a smooth interior wall to minimize friction losses.
- Pipe shall have a structurally designed corrugated exterior to provide resistance to external soil and traffic loads.
- Pipe shall be free from cracks, holes, blisters, and other manufacturing defects.

For 12- through 15-inch single-wall highway pipe, manufacturers commonly specify ASTM D3350 cell classification 435400C. Verify the applicable classification against the selected pipe product.

3. Pipe dimensions

Typical dimensions for nominal 15-inch HDPE dual-wall drainage pipe:

Parameter	Typical value
Nominal inside diameter	15 inches
Outside diameter	Approximately 18 inches
Pipe length	20 feet
Interior configuration	Smooth
Exterior configuration	Corrugated
Wall construction	Dual-wall profile

Actual dimensions and tolerances must be confirmed using the manufacturer's product data sheet.

4. Joint requirements

- Joints shall be compatible with the pipe manufacturer's recommendations.
- Provide bell-and-spigot joints with elastomeric rubber gaskets or approved couplings.
- Gaskets shall be properly seated to provide the required joint performance.
- Joints shall be soil-tight at a minimum for standard storm drainage applications.
- Provide watertight joints where required by project specifications.
- Connections to manholes, catch basins, and other structures shall use approved watertight or soil-tight adapters.

5. Trench preparation and installation

Item	Recommended requirement
Trench excavation	As required by pipe diameter and installation conditions
Trench bottom	Uniform, stable, and free of unsuitable material
Bedding material	Granular material conforming to ASTM D2321
Bedding thickness	Typically 4–6 inches
Pipe placement	Install to specified line and grade
Haunching	Carefully place and compact material beneath pipe haunches
Initial backfill	Approved granular material
Backfill compaction	Per project geotechnical and pipe installation requirements
Final backfill	Suitable excavated material or approved fill

Important installation requirements:

- Do not place pipe on frozen, unstable, or unsuitable subgrade.
- Ensure continuous support along the pipe barrel.
- Properly compact the haunch areas to prevent excessive pipe deflection.
- Avoid heavy construction equipment directly over inadequately covered pipe.
- Maintain the required minimum cover based on traffic loading, embedment, and manufacturer's recommendations.

6. Applicable standards

Standard	Description
AASHTO M294	Corrugated Polyethylene Pipe, 12–60 inches
ASTM F2306	Profile Wall Polyethylene Pipe for Gravity-Flow Applications
ASTM D3350	Polyethylene Plastics Pipe and Fittings Materials
ASTM D2321	Underground Installation of Thermoplastic Pipe
ASTM D3212	Joints for Drain and Sewer Plastic Pipes
ASTM D1056	Flexible Cellular Materials – Sponge or Expanded Rubber
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe