DRAFT **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)

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

Skanska USA Building Inc. »
518 East Township Line Rd
Suite 200 »
Blue Bell, PA 19422 »

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

«County of Montgomery »
«Montgomery County Courthouse »
«PO Box 311
Norristown, PA 19404»

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

The Project is subject to the requirements of the Pennsylvania Separations Act (53 P.S. Section 1003). These General Conditions, as amended, shall be applicable to the activities and Work of each of the Contractors separately engaged by the Owner as set forth in their respective Agreements.

It is the desire of the Owner to implement and have all of the participants on the Project utilize and adhere to procedures promulgated by the Lean Construction Institute (collectively, the "Lean Procedures") which shall be coordinated by the Construction Manager. Contractor shall refer to Specification Section 01-3200.

Notwithstanding anything to the contrary contained herein, each prime Contractor is responsible for scheduling its day-to-day activities and tasks. Each prime Contractor shall provide schedules and updates to the Construction Manager in a timely manner, who shall prepare and manage the overall Construction Schedule as hereinafter defined. The Construction Manager shall oversee the overall progress of the Work and Project.

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 are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement), as amended and consist of the Agreement, Conditions of the Contract (consisting of these General Conditions of the Contract, as amended and any Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to or after the execution of the Contract, other documents listed in the Agreement, 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. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements. The Contractor shall be fully familiar with all documents relating to the Project. In the event of a conflict with other contractors regarding scope, the Construction Manager shall make a determination which shall be binding on the Contractor.

§ 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) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to the performance and enforcement of the obligations under the Contract intended to facilitate the performance of their respective duties. The Owner shall be entitled to performance of the obligations intended for its benefit, and to enforcement thereof. If any Contractor fails to fulfill its responsibilities in the performance of its Work, as described in the Contract Documents, the Contractor shall remain responsible to the Owner for the final completion of the Work and for any damages, losses, costs and expenses incurred by the Owner as a result of claims by a separate contractor engaged by the Owner for the Project. The Contractor acknowledges: a) that the Work is an obligation intended for the benefit of the Owner; and b) that none of the Subcontractors of the Contractor shall have contractual or third party beneficiary rights against the Owner due to any of the Owner's obligations hereunder; and c) each of the prime Contractors engaged by the Owner for the Project may be dependent upon the timely Work of the Contractor. The Contractor shall cause its Subcontractors to so acknowledge in their respective Subcontracts. However, the Owner shall be understood to be a third-party beneficiary of the performance obligations of each and all of the Subcontractors.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract ,whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor and the Subcontractors, Sub-subcontractors at every level, material suppliers and other entities for whom the Contractor is responsible to fulfill the Contractor's obligations, under its Contract, whether on or off the Property. The Work constitutes a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents and which includes construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 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.

§ 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 applicable to the Contract and the Work thereunder, whenever issued showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

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§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents applicable to the Contract and the Work thereunder 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 PROPERTY. The Property is the real property and all improvements thereon known as Montgomery County Justice Center and located at 2 East Airy Street, Norristown, Montgomery County, PA 19401.

§ 1.1.11 PROJECT SITE. The Project Site is the Property, including the improvements thereon, and the location of the site where the Work by the respective Contractors is to be performed.

§ 1.1.12 Architect's Supplementary Instructions. Supplementary drawings, written instructions or an order for minor modifications of any of the Work issued by the Architect which does not involve an adjustment to the Contract Sum or an extension of the Contract Time.

§ 1.1.13 Addenda. Forms issued by the Architect prior to or after the execution of the Contract which interpret or modify the Bid Documents by additions, deletions, clarifications or corrections.

§ 1.1.14 Bid Documents. The drawings, specifications and other Contract Documents which are issued to prospective bidders for Contracts for the Work – in conformity with the Separations Act and applicable public bidding requirements – including any requests for proposals or other invitations to bid, and related documents that are to be executed and submitted by the Contractor with its bid proposal for the Work for the Project for which the prospective bidder submitted its bid.

1.1.15 Bulletin (or AIA Form G709 - Proposal Request). Form issued by the Architect after the execution of the Contract at the direction of the Owner, requesting a cost proposal for changes in the Work which are outlined and described in the Bulletin, which may also include revised Drawings and/or revised Specifications.

§ 1.1.16 Notice to Proceed. Written authorization to the Contractor from the Owner to commence construction activities pursuant to the Contract applicable to such Contractor. The Notice to Proceed may be delivered in person by Owner to the Contractor or mailed to the Contractor by certified or registered mail, return receipt requested.

§ 1.1.17 Indemnitees. Owner, the Architect, Construction Manager, and each of their respective officers, directors, employees, agents, representatives, successors, and assigns.

§ 1.1.18 Government Authorities (or Authorities Having Jurisdiction or AHJ). Any federal, state, local governmental entity or authority having jurisdiction over the Work, the Project or the Contractor.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents with respect to the Work of Contractor is to include therein or by reference 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.

§ 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.

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§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control any Contractor in dividing the Work among its Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 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 Subject to the provisions of Section 1.2.5, in the event of inconsistencies within or between parts of the Contract Documents applicable to the Work of a Contractor, 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 and direction.

§ 1.2.5 The Architectural and Structural Drawings and details shall govern in the event of any conflicts between such Drawings and the Mechanical and Electrical Drawings, but not to the extent of allowing , nor shall the foregoing relieve the Mechanical or Electrical Contractor of responsibility for the omission of any items shown on Mechanical and Electrical Drawings.

§ 1.2.6 The provisions of the Contract Documents applicable to each Contract are binding on the Contractor, Subcontractors, and Sub-subcontractors for all Work shown or indicated on the original Contract Documents applicable thereto plus any additional work authorized by change order, interpretation or field orders pursuant to such Contract Documents.

§ 1.2.7 Should a conflict occur in or between any drawings and/or specifications, the Contractor is deemed to have estimated on and agreed to perform the more expensive way of doing the Work under its Contract. Manufacturer's equipment specifications are based on models and/or construction and installation procedures prevailing at the date of the invitation and/or advertisement to submit bid proposals. Equipment installations requiring modifications due to manufacturer's model and/or construction changes and other variations from the items specified shall be furnished and installed by the Contractor at no additional cost to Owner.

§ 1.2.8 Requests by the Contractor for written interpretations and/or detail drawings shall be made to the Architect in a timely manner such as will allow ample time for their preparation and delivery without causing delays in the Work or the Project. Failure of the Contractor to request needed clarifications and/or in the event of its proceeding with affected work prior to receiving same, shall indicate its acceptance of any and all costs and/or delays required on account of necessary corrections.

§ 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.

§ 1.4 Interpretation

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.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 Instruments of Service, including the Drawings and Specifications, are and shall remain property of the Owner and the Owner will retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. None of the Contractors, Subcontractors, sub-subcontractors, and suppliers shall own or claim a copyright in the Instruments of Service. Submittal or distribution of any Drawings or Specifications to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Owner's reserved rights.

§ 1.5.2 The Contractors, 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 Contractors, Subcontractors, Sub-subcontractors, and suppliers

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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 prior written consent of the Owner.

§ 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 if a method for electronic transmission is set forth in the Agreement.

§ 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.

§ 1.7 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, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 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 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, 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. The Contractor acknowledges that 3D Computer Model is not a part of the Construction or Contract Documents for the Project and that Architect makes no representations or warranties, express or implied, regarding the 3D Computer Model, the accuracy or completeness of the 3D Model or the data and/or information contained therein. Contractor will be required to execute Architect's standard 3D Computer Model release form prior to Contractor's use of said Model.

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. 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. Contractor recognizes that the Owner is a public body and may only act through its governing body.

§ 2.2 Evidence of the Owner's Financial Arrangements – Intentionally Omitted

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for building permit and related fee that are the specific responsibility of the Owner under the Contract Documents, the Contractor shall secure and pay for all necessary approvals required for construction, and the performance of its Work. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall cooperate with the Construction Manager as necessary to enable the Construction Manager to secure the building permit. The Contractor shall be responsible for any and all costs associated with road closures, sidewalk closures, parking fees and such other costs related to their Work including, but not limited to those identified in the Contract Documents.

§ 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.

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§ 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.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish available surveys describing physical characteristics, legal limitations and utility locations for the Project Site, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall in any event exercise proper precautions relating to the safe performance of the Work as noted below.

§ 2.3.6 The Contractor shall check such surveys and if the Contractor notes any inaccuracies in such surveys with the observable physical conditions of the Property and the Contract Documents, it shall so promptly notify Owner in writing. Contractor assumes full responsibility for timely acquainting itself by visual observation and review of information contained in the documents provided by Owner, Architect and Construction Manager with the location of its Work, with the location of utilities situated on, near or under its Work site or otherwise affecting its Work as shown on the Drawings and Specifications, the soils, subsurface conditions and all other construction activity and conditions presently occurring on the Project Site, as well as that being proposed at the Project Site whether to be performed by another Contractor or otherwise.

§ 2.3.6.1 The Owner shall furnish any information or services under the Owner's control and relating to the Contractor's performance of its Work with reasonable promptness to avoid delay in the orderly progress of such Work after receiving the Contractor's written request for such information or services.

§ 2.3.7 The Owner and Contractor shall forward all communications to the Construction Manager.

§ 2.389 The Owner shall not be precluded or estopped by any approvals made or given by them under any provision or provisions of any Contract and subject thereto, at any time, either before or after the completion and acceptance of the Work thereunder and payment therefor, from identifying the true and correct amount and character of the Work performed and materials and equipment furnished by the Contractor and its Subcontractors; nor from showing at any time that the Work or materials, equipment or any parts thereof do not conform to the Drawings and Specifications and the other Contract Documents applicable to the Contractor. The Owner shall have the right to reject the whole or any part of the aforesaid Work or materials and equipment should the said Work be inconsistent and not in compliance with the terms of the applicable Contract, or otherwise improperly performed or defective; and the Owner shall not be precluded or estopped from demanding and recovering from the Contractor and its Subcontractors or both, such costs, expenses or damages as it may sustain or incur by reason of their failure to comply with the terms of the Contract Documents applicable to the Contractor, or on account of any over-payments made based on any estimate or certificate. Neither the acceptance by the Owner, nor any certificate approved for payment of money, nor any payments for, nor acceptance of the whole or any part of the Work by the Owner, nor any extension of time, nor any possession taken by the Owner shall operate as a waiver of any portion of the Contract Documents applicable to the obligations of the Contractor or any power herein reserved by the Owner or any right to damages by the Owner, nor shall any waiver of any breach of the such applicable Contract Documents be held to be a waiver of any other or subsequent breach by the Contractor.

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§ 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 or repeatedly fails to carry out its Work in accordance with such Contract Documents, the Owner by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order 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. Owner's exercise of the right described in this § 2.3 shall not give rise to any extension of the Contract Time nor increase in the Contract Sum**.**

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out its Work in accordance with the Contract Documents and fails within a five-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 immediately, without prejudice to any other remedies the Owner may have, correct such default or neglect and hold the Contractor responsible for all costs and expenses associated therewith, including reasonable professional fees. The Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify any Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and any compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.6 Additional Rights

§ 2.6.1 Contractor shall provide access to the Project Site and the Work so that Owner, Architect, Construction Manager and their representatives may perform their functions under the Contract Documents.

§ 2.6.2 The rights stated in this Article 2 shall be in addition to and not in limitation of any other rights of the Owner granted in the Contract Documents or at law or in equity.

§ 2.6.3 Owner shall have right to occupy, take possession of and/or use, or permit any designated person to occupy or use, any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or such portions may not have expired, but such occupancy, taking possession and use shall not be deemed an acceptance of any Work that is deficient or not completed in accordance with the Contract Documents applicable thereto. Any such occupancy, possession and/or use by the Owner will not relieve any Contractor of its obligation to maintain insurance in accordance with Article 11 of its Contract.

§ 2.6.4 The Owner's exercise of any of its rights or remedies under any of the Contract Documents including, without limitation, ordering changes in the Work or any portion thereof, or directing suspension, or correction of the Work or any portion thereof, and regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as interference, active or otherwise, with the Contractor's performance of the Work under its Contract.

§ 2.6.5 Owner will not be responsible for and will not have control or charge over construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with any of the Work and/or the Project, and Owner will not be responsible for any Contractor's failure to carry out the Work under its Contract in accordance with the applicable Contract Documents and applicable laws, rules and regulations. Owner will not be responsible for or have control or charge over the acts or omissions of any Contractors, Subcontractors, or any of their agents or employees, or any other person performing any of the Work.

§ 2.6.6 Owner has the authority to reject any portion of the Work which does not conform to the Contract Documents applicable thereto or which is otherwise deficient. Whenever, in its sole opinion, Owner considers it necessary or advisable for implementation of the intent of the Contract Documents applicable thereto, Owner will have the authority to require special inspection or testing of the Work in accordance with § 13.5.2 whether or not such Work is then fabricated, installed or completed. However, neither Owner's authority to act under this § 2.5.6, nor any decision made by Owner in good faith, either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of Owner to any Contractors, Subcontractor, any of their agents or employees, or any other person performing any of the Work.

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§ 2.6.7 In the event the Owner or Construction Manager determines that the progress of the Work affecting the critical path of the Agreed Construction Schedule is behind or otherwise does not comply with the progress set forth in the Agreed Construction Schedule due to delays of any Contractor or its Subcontractors in performing the Work under its Contract pursuant to the Agreed Construction Schedule, such Contractor is not entitled to receive an extension of the Contract Time or additional compensation in accordance with Contract Documents. Such Contractor shall submit to Owner and Construction Manager for their approval a "Recovery Plan" within 5 business days of request by the Construction Manager which will indicate the manner in which such Contractor intends to get its Work back on schedule in accordance with the Agreed Construction Schedule, which may include, without limitation, increasing the number of workmen performing the Work, utilizing overtime work and requiring additional work shifts and such other information as the Construction Manager may require. Such plan shall be implemented within twenty-four hours of the Construction Manager's approval. The costs and expenses of preparing and implementing the Recovery Plan shall be borne solely by the Contractor and shall not be the subject of a Change Order modifying the Contract Time or Contract Sum. In addition, the Contractor shall bear responsibility for any and all costs, damages, losses and expenses of the Owner, including professional fees, in connection with any Change Orders or claims by other Contractors arising out of or related to delays or impacts from the Contractor failing to comply with the progress set forth in the Agreed Construction Schedule ("Impact Costs"). The Owner shall be entitled to offset such Impact Costs against any sums due the Contractor or if sufficient Contract Sums are not remaining, the Contractor shall pay the Owner for the Impact Costs within seven (7) days of written demand.

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, unless otherwise noted. The Contractor shall be lawfully licensed, if required 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 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 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, except for such activities or duties specifically assumed by Owner under any of the Contract Documents.

§ 3.1.4 Except as and to the extent specifically provided in § 2.3 and § 9.7, each Contractor shall proceed diligently with the performance of the Work under its Contract at all times in accordance with the Contract Documents applicable thereto. Such performance shall continue despite any disputes or delays and pending resolution of any request for relief, claim, appeal or other legal or equitable action related to the Contract. Contractor acknowledges and agrees that the timely provision of schedule updates and information is necessary for the overall success of the Project and will be responsible for any and all damage, costs and expenses arising out of its failure to do so. In no event shall Contractor delay the Project in the event of a good faith dispute.

§ 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:

.1 Contractor has examined all of the applicable documents pertaining to the Work under its Contract and the Project Site.

.2 Contractor has visited the Project Site, has familiarized itself as to the Work to be performed by the Contractor and by the other Contractors on the Project, and job conditions, and has satisfied itself as to the accessibility to and general character of the Project Site, the nature of the Work under its Contract, visible conditions of any existing buildings and structures at the Project Site, the location of all utilities, the character of the equipment and facilities needed preliminary to and during prosecution of the Work under its Contract, the general and local conditions under which such Work is to be performed, construction hazards, and all other matters which could in any way affect the construction means, methods, techniques and procedures involved in the Contractor's Work under the Contract Documents applicable thereto, and has correlated its observations with the requirements of the Contract Documents applicable to such Work. The Contractor and each Subcontractor shall evaluate

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and satisfy themselves as to the conditions and limitations under which the Work is to be performed including without limitation (a) the location, condition, layout, nature of the Project Site and surrounding areas, including space available for the storage or placement of its on-site offices, materials and equipment as well as the other Contractors, as determined and coordinated by the Construction Manager, (b) generally prevailing climatic conditions, (c) anticipated labor supply and cost, (d) availability and costs of materials, tools and equipment and (e) other similar issues unless specified in the Contract Documents. The Owner assumes no responsibility or liability for the safety conditions of or at the Project Site or any improvements located at the Project Site, or any personnel, materials or equipment at any time located thereon in connection with the Project. Contractor has satisfied itself by its own investigation and research regarding the materials and equipment to be furnished by it and as to the meaning and intention of the Drawings and Specifications and these General Conditions, and other Contract Documents, referred to herein. Contractor has based its decision to execute its Contract and the other Contract Documents on its review of the Contract Documents, its own investigation and observations and the information it has obtained from the Bid Documents, Owner, Architect or others and reviewed to its own satisfaction. No verbal agreement or conversation with any representative of Owner, either before or after the execution of its Contract shall affect or modify any of the terms, conditions or obligations contained in the Contract and other Contract Documents. Contractor is not relying on any representations by Owner or any other party with respect to its Work under its Contract and any of the obligations, responsibilities or liabilities imposed upon the Contractor in the Contract Documents.

.3 Contractor is fully aware of the critical time restrictions for performance and completion of its Contract, and of the importance for its coordination of its scheduling and performance of its Work with the Construction Manager and with those of the other Contractors working on the Project.

.4 Contractor is fully aware of the state, contents and provisions of the Specifications and Drawings, and other Contract Documents, as of the date of this Contract.

.5 Contractor is an expert in planning and performing major construction such as the Project and the Work to be performed under its Contract, and in working on multiple prime contract projects such as the Project.

§ 3.2.2 The Contractor shall, prior to starting each portion of its Work and thereafter during the course of such Work, carefully study and compare the Contract Documents applicable thereto with each other and with information furnished by the Owner pursuant to § 2.2.3 and shall at once report to the Architect any errors, inconsistencies or omissions discovered or which the Contractor should have discovered therein or relating thereto, as well as any variance from applicable laws, statutes, ordinances, building codes, rules, regulations or any lawful orders of any governmental body or public or quasi-public authority, which the Contractor knew or should have known. The Contractor shall not be liable to the Owner or Architect for any damages resulting from errors, inconsistencies, omissions, or variances in the Contract Documents unless the Contractor knew of or should have known of such error, inconsistency, omission or variance, and failed to timely report it in writing to the Architect. If the Contractor performs any construction activity which it knew or should have known involved an error, inconsistency, omission, or variance in the Contract Documents without such prior notice to the Architect, the Contractor shall assume responsibility for such performance and shall bear all the attributable costs for correction irrespective of the cause or source thereof.

§ 3.2.3 The Contractor shall take field measurements and verify field conditions relating to the performance of its Work and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Survey drawings describing utility locations are included with the Contract Documents for information purposes only. The Contractor shall, not less than seven days prior to commencing activities, notify or inform the Pennsylvania One Call System of the commencement of any activities relating to its Work that will or may disturb utility service. Errors, inconsistencies or omissions discovered as the result thereof shall be reported to the Architect, Construction Manager and Owner at once, and the Contractor shall not proceed with its Work until written instructions have been received from the Architect. .

§ 3.2.4 Contractor shall promptly notify Architect, Construction Manager and Owner, in writing, of materials, systems, procedures or methods of construction either shown on the Drawings or specified in the Specifications which the Contractor reasonably believes are incorrect or inappropriate for the purposes intended, or for which Contractor objects to furnishing the warranties required by the applicable Contract Documents. Architect, Construction Manager and Owner will make a determination of such matters in writing. Contractor shall be responsible for any additional costs resulting from its failure to promptly notify Architect, Construction Manager

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and Owner in writing that such materials, systems, procedures and methods are incorrect or inappropriate to the extent Contractor was aware thereof

§ 3.2.5 The Contractor shall perform its Work in accordance with the Contract Documents applicable thereto and shop drawings and other submittals relating thereto reviewed pursuant to § 3.12. The Contractor shall make no changes therefrom without prior written acceptance by the Construction Manager and Owner. Where there is an ambiguity or discrepancy, or where detailed information is lacking, the Contractor shall inquire of and refer to the Owner, Construction Manager and Architect for clarification or information before ordering any products or proceeding with its Work. The Contractor shall perform its Work reflecting the correction of such errors, inconsistencies, and omissions subject to upon Owner's execution of appropriate Change Orders therefor. Work ordered, fabricated or constructed by the Contractor, when the Contract Documents do not clearly specify in detail the Work to be done or where the Work conflicts with such Contract Documents without the issuance of such Change Orders, shall be corrected by Contractor without claim for an increase in the Contract Sum or an extension of the Contract Time. Recommendations of Architect with regard to such ambiguities or discrepancies shall not make Architect an arbitrator to establish the responsibilities of the Subcontractors to the Contractor with regard to the Subcontractors' portions of its Work.

§ 3.2.6 The Contractor shall furnish, without claim for an increase in the Contract Sum or Contract Time, all work and materials not mentioned or shown, but reasonably inferable from the Contract Documents applicable to its Contract as necessary for the proper execution and completion of its Work. The Contractor shall furnish, without claim for an increase in the Contract Sum or Contract Time, any work and material not mentioned or shown, required to conform the Contractor's Work to all applicable laws and rules and regulations involving construction means, techniques, methods and procedures promulgated by all federal, state, and local governmental and quasi-governmental agencies having jurisdiction over its Work. Except for design responsibility related to its means and methods of construction and delegated design and engineering specifically required by the Contract Documents as outlined in Section 3.12.10.1, nothing in this paragraph shall be construed to impose upon the Contractor any responsibility for the design of its Work, which the Owner acknowledges shall be the responsibility of the Architect.

§ 3.2.7 Dimensions indicated on the Drawings applicable to the Contractor's Work are required dimensions, regardless of measurement per given scale. The Contractor shall verify at the Project Site necessary levels, measurements, etc., for complete fabrication, assembly and installation, fitting of equipment, fixtures and its Work. Where dimensions are not indicated and the exact location is not apparent, the Contactor shall promptly notify the Architect, Construction Manager and Owner, and the Architect shall compute the required measurements. Inadvertent discrepancies, or contradictions, or omissions of details, figures or notes of one drawing which are correctly given on another drawing shall not be cause for additional charges or claims by the Contractor or a change in the Contract Time.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 In conjunction with and subject to the overall direction and coordination by the Construction Manager of the Contractor's Work being performed at the Project, the Contractor shall supervise and direct Work in collaboration and cooperation with the Construction manager and other Contractors as provided in these General Conditions, using the Contractor's best skill and attention provided, however, the Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for performing and coordinating all portions of the Work under its Contract.

§ 3.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing any portions of the Contractor's Work for, or on behalf of, the Contractor or any of its Subcontractors or claiming by, through or under the Contractor, and for any damages, arising out of, relating to and/or resulting from performing portions of the Contractor's Work under a contract with the Contractor.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 Notwithstanding any provision of these General Conditions, the Contractor shall not be relieved of any obligations to perform its Work in accordance with the Contract Documents applicable to its Contract either by the

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activities or duties of the Owner, Construction Manager or the Architect in their administration of the Contract, or by any tests, inspections or approvals required or performed by persons other than the Contractor

§ 3.3.5 The Contractor shall be responsible for laying out its Work and shall be responsible for all lines, elevations and measurements of its Work. The Contractor must exercise proper precautions to verify all figures shown on the applicable Drawings before laying out its Work and will be responsible for any errors or omissions resulting from the failure to exercise such precautions.

§ 3.3.6 Contractor shall not cause or permit any disruption to the streets and utilities serving any occupied portion of the Project, the remainder of the Project, work being performed by other Contractors on the Project or other properties (whether or not owned by the Owner or part of the Property) without Owner's prior consent, which may be conditioned upon restrictions in the time, place and manner of such disruption.

§ 3.3.7 The Contractor shall review the construction schedules, shop drawings, product data, samples and reference standards for the work of each Subcontractor to properly execute and complete the Contractor's Work without discrepancy where the work of one trade or Subcontractor joins, or is on or impacts the work of another trade or Subcontractor. The Contractor shall coordinate the relations and activities of the various Subcontractors and trades for the orderly prosecution and progress of its Work and shall ensure that required anchorage, blocking or other interactive elements are furnished and set at proper times in accordance with the detailed requirements for the proper execution of the Contractor's Work.

§ 3.3.8 Every trade or Subcontractor preparing to work in an area previously prepared or worked upon by another trade or Subcontractor shall review and approve the previously installed Work and the area prior to commencing, and shall not commence their Work in the event that the previously installed Work was not performed properly. Contractor shall ensure that any allegedly unsatisfactory conditions in the previously installed Work and/or area are reported to the Construction Manager and Owner and that no Work is done in the affected area until the unsatisfactory conditions have been eliminated or corrected. Commencement of Work by a trade or a Subcontractor of the Contractor shall constitute approval and acceptance of the prior Work and the area by the Contractor and the trade or Subcontractor.

§ 3.3.9 Owner, the Contractor, Construction Manager and Architect, or any of them, shall hold meetings at the Project Site at such times as the Owner requests, including, without limitation with the Contractor and the other Contractors involved with the Project.

§ 3.3.10 Where the Contract Documents applicable to the Contractor's Work refer to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used on the Contractor's Work, such mention is intended only to indicate that the operations of and as determined by the Contractor shall be such as to produce the quality of Work implied by the operations described, but that the actual determination of whether the described operations may be safely or suitably employed on the Work shall be the responsibility of the Contractor, who shall notify the Architect and Construction Manager in writing of the actual means, methods, techniques, sequences or procedures which will be employed on the Work if these differ from those mentioned in such Contract Documents. All loss, damage or liability, or cost of correcting defective Work of the Contractor arising from the employment of any construction means, methods, techniques, sequences or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents applicable to the Contractor's Work.

§ 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 its Work, whether temporary or permanent and whether or not incorporated or to be incorporated in such Work.

§ 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.

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§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out its Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. Contractors and their employees cannot engage in behavior that is rude, threatening, or offensive. Harassment of any type, including sexual harassment is strictly prohibited. Abusive, derogatory, obscene or improper language, gestures, remarks, whistling, cat calls or other disrespectful behavior shall not be tolerated by the Contractor.

§ 3.4.4 The Contractor will be held to be reasonably familiar with all conditions affecting the labor to be utilized by the Contractor in performing its Work on the Project, including but not limited to unions, incentive pay, working conditions, procurement, living and community conditions. The Contractor shall hereby assume responsibility to the Owner for all costs resulting from the failure to verify all conditions potentially affecting its labor for the Project. The Contractor shall be responsible for the maintenance and observance of sound labor practices by its own force in performing its Work, and shall be responsible for the observance of sound labor practices by its Subcontractors and all other Sub-subcontractors, vendors and suppliers performing its Work, and shall comply with the terms of all labor agreements to which it is bound and take all steps necessary to avoid labor disputes and the potential delay and disruption arising therefrom.

§ 3.4.5 All material and equipment delivered to Project Site shall be so stored, handled and secured as to preclude loss, theft, intrusion of any foreign substance or causing of any discoloration or other deterioration therein and to prevent any damage thereto which might reduce its effectiveness and/or warranted condition as part of the Contractor's Work. Any damaged or rejected material or equipment shall be immediately removed from the Project Site.

§ 3.4.6 All Work described or required as part of the Contractor's Work shall be executed in a neat, skillful, workmanlike manner in accordance with best recognized trade practices, and the applicable Contract Documents and governmental laws, rules, regulations and ordinances. Only competent workmen who satisfactorily perform their duties shall be employed by the Contractor on the Project and, when requested by Owner, the Contractor shall discharge and shall not re-employ on the Project any person who commits trespass or who is, in the Owner's opinion, disorderly, dangerous, insubordinate, incompetent or otherwise objectionable.

§ 3.4.7 Any material or equipment specified in the Contract Documents applicable to the Contractor's Work by reference to the number, symbol, or title of a specific standard such as that of the American Society for Testing Materials (ASTM), a Product or Commercial Standard, Federal Specification or other similar standards, or where the applicable Specifications contain no revision date, shall comply with the requirements of the latest revision thereof and any supplement or amendment thereto, in effect on the date of receipt of bids. The standards referred to, except as specifically modified in the applicable Specifications, shall have the same force as if they were printed in full context within the Specifications.

§ 3.4.8 Where it is required in the Specifications that materials, products, processes, equipment or the like be installed or applied in accordance with the manufacturer's instructions, directions, or specifications or words to this effect, it shall be construed to mean that said application or installation shall be in strict accordance with current published instructions furnished by the manufacturer of the materials, products, processes and/or equipment concerned for use under conditions similar to those at the Contractor's Work site. Unless otherwise stated, the Contractor shall furnish one (1) copy each of instructions to Owner, the Construction Manager, and the Architect.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that all materials and equipment furnished and installed under the Contract will be of good quality and new unless the Contract Documents applicable thereto require or permit otherwise. The Contractor further warrants that its Work will conform to the requirements of the Contract Documents will be free from defects, except for those inherent in the quality of such Work that the Contract Documents require or permit. Work, materials, or equipment provided as part of the Contractor's Work not conforming to these requirements shall be considered defective. The Contractor's warranty relating to its Work excludes remedy for damage or defect caused by abuse, alterations to its Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Owner, Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Contractor shall coordinate all of its Work of like material in order to produce harmony of matching finishes, textures, colors, etc., throughout the various components

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of its Work and the Project Notwithstanding anything to the contrary contained in this § 3.5.1, the installation of finish materials in and as part of the Contractor's Work, including without limitation, brick, stone, glass, or wood, that have a naturally occurring variation in appearance, color, grain, or texture, shall be considered defective work if, in the opinion of Owner, Construction Manager or Architect, the result of such installation detracts from the appearance or aesthetic quality of the Contractor's Work or the Project, or any portion thereof. Prior to the installation of any such finish materials in and/or as part of the Contractor's Work, the Contractor shall submit a variety of samples of such finish materials to the Owner, Construction Manager and Architect. The Owner, Construction Manager and Architect shall inspect the samples and shall approve of a range of naturally occurring variations in appearance, color, grain, or texture for such finish materials. Finish materials that are submitted by the Contractor as provided above and within the range approved by Owner, Construction Manager and Architect shall not be considered defective.

§ 3.5.1.1 In addition, the Contractor agrees to perform its Work in such a manner so as to preserve any and all manufacturer's and other warranties or guarantees applicable thereto. The Contractor shall furnish seventy-two (72) hour callback service for all equipment provided by Contractor as part of its Work for a period of one (1) year after the making of final payment for and acceptance of its Work; provided, however, that notwithstanding the foregoing, the Contractor shall provide prompt emergency call back service for all pumping systems, security systems, emergency generator, electric switch gear, smoke exhaust fans, chillers, domestic water heaters and all other vital systems included within its Work.

§ 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. Any fee required for the transfer of any Warranty or Guarantee shall be the sole responsibility of the Contractor.

§ 3.6 Taxes

The Contractor shall pay all 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.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, and with cooperation from the Contractor, shall secure and pay for the building permit. The Contractor shall secure and pay for all other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of its Work that are customarily secured after execution of the Contract and legally required at the time bids are received, and shall pay all fees and charges for connections to outside utility and other services; the use of municipal or private property for the storage and/or placement of its materials, parking, storage or personnel trailers or similar facilities; all utility services, temporary obstructions, enclosures, opening and patching of streets, etc., off of the Property arising from or related to the performance and completion of its Work.

§ 3.7.2 The Contractor shall comply with and give all notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of its Work.

§ 3.7.3 If the Contractor performs Work when it knew or should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of governmental authorities, the Contractor shall assume full responsibility for such Work and shall bear the costs attributable hereto.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor contends that the actual Project Site or Work site conditions differ materially from the Project Site or Work site conditions disclosed by the Owner to the Contractor in the Contract Documents or ascertainable upon visual observation thereof by the Contractor, the Contractor shall promptly give written notice to the Owner, Architect and Construction Manager of (1) any subsurface or latent physical conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents known physical conditions at the Project Site or Work site of an unusual nature that differ materially from those ordinarily encountered to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, or (3) the existence of toxic or hazardous materials or substances not specifically described and identified in the Contract Documents , the Contractor shall promptly provide notice thereof to the Owner, Construction Manager, and the Architect before any

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conditions are disturbed and in no event later than 48 hours after the Contractor's first observance of the conditions. The Owner, Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they after receiving such notice. If the conditions encountered as the result of such investigation do not differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, the performance of any part of the Contractor's Work pursuant to the Contract Documents applicable thereto, whether or not changed as the result of the conditions, a mutually agreed upon adjustment shall be made in the Contract Sum, and/or Contract Time if applicable, pursuant to the Contractor's Contract. If the Owner, Architect, in consultation with the Construction Manager, if applicable, pursuant to the Contractor's Contract. If the Owner and the Contractor cannot agree on an adjustment to the Contract Sum or the Contract Time, any adjustment relating thereto shall be subject to further proceedings and to the claims and dispute resolution process as provided in Article 15. Notwithstanding anything set forth herein to the contrary, the Contractor shall not be entitled to an adjustment in the Contract Sum or the Contract Time if such unknown or concealed condition(s) is: (i) of a usual nature or does not differ materially from those ordinarily encountered and generally recognized as inherent in construction activities of the character provided for in the Contract Documents; (ii) not materially different from those conditions disclosed or which reasonably should have been discerned or anticipated by the Contractor's prior work, inspection, tests and reviews; or (iii) of a nature which the Contractor or any of its Subcontractor or Sub-subcontractors should reasonably know or anticipate based on any of the foregoing.

§ 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, if any, necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations affected by such discovery 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 Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 A copy of the building permit(s) applicable to the Contractor's Work shall be delivered to the Architect, Construction Manager and Owner as soon as it is obtained. Upon final completion of its Work, the Contractor shall deliver all original permits, licenses and certificates relating to such Work to the Owner and shall deliver photocopies thereof to the Construction Manager and Architect.

§ 3.7.7 The Contractor shall give all notices and comply with all federal, state and local laws, ordinances and regulations bearing on the Contractor's means, methods, techniques or procedures of the Work under its Contract as exist as of the date of the Contract, or as may be thereafter enacted during the prosecution of its Work by any Governmental Authorities having any jurisdiction or authority over the Work and the performance thereof. The Contractor shall indemnify and save harmless the Indemnitees against any claim or liability (and any and all related costs, expenses or attorneys' fees) arising from, or based on, the violation of any such laws, ordinances, regulations, orders or decrees, whether by itself or its Subcontractors, Sub-subcontractors, suppliers or employees.

§ 3.7.7 The Contractor shall consult with the appropriate departments of the Government Authorities from time to time to ensure that it has satisfied and is satisfying all conditions and requirements of the Government Authorities with regard to the performance and inspection of its Work, and shall use its best efforts to expedite resolution of any conflicts and discrepancies concerning any inspection and performance requirements for issuance of certificates of occupancy relating to its Work. The Owner, Construction Manager and Architect will provide their full cooperation in connection therewith. Any such conflicts or discrepancies which the Contractor may discover at any time shall be promptly brought to the attention of the Owner, Construction Manager and Architect and shall be resolved immediately by the Contractor in consultation with the Owner, the Construction Manager, the Architect and the Government Authorities involved.

§ 3.7.8 Within ten (10) days of Owner's request, the Contractor shall execute and deliver to Owner a certificate addressed to Owner confirming the compliance of the Contractor's Work with the applicable Contract Documents and applicable laws and regulations, the status of completion of its Work, the status of any payments and defaults relating to its Work, and such other matters as Owner may request.

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§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Document. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 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 Project Site, all labor and all required taxes, less applicable trade discounts; and
- **.2** Whenever the actual costs attributed to any allowances; and
- **.3** are more than or less than the amount of such allowance, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs incurred and the respective amounts of the allowances established under §3.8.2.1.

§ 3.8.3 Materials and equipment to be provided by the Contractor under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent and Project Manager

§ 3.9.1 The Contractor shall employ a competent Project Superintendent and necessary assistants, all of whom shall be in full-time attendance at the Project Site during the performance of the Contractor's Work. The Contractor shall also employ a Project Manager on a full-time basis to oversee the entire Work of the Contractor. Such persons shall be those named on Exhibit B attached to its Contract, and shall not be changed without the prior written consent of the Owner unless any of them shall cease to be in the Contractor's employ. Upon reasonable request of the Owner, the Contractor shall remove from the Project any member of the Contractor's staff or other employee of the Contractor who, in the Owner's sole opinion, is incompetent, uncooperative, or fails to satisfactorily discharge the Contractor's responsibilities under the Contractor's Contract, or is otherwise reasonably objectionable to the Owner, Construction Manager or Architect. The Contractor shall promptly provide replacements for such removed individuals, who shall be satisfactory to the Owner. The cost and expense of effecting such replacements shall be paid for by and the sole responsibility of the Contractor, as part of its overhead costs, unless the removal was at the Owner's request for reasons other than that the staff member or other employee was incompetent, uncooperative, or failed to satisfactorily discharge the Contractor's responsibilities under its Contract. The Project Superintendent and Project Manager shall represent the Contractor, and all communications given to the Project Manager or Project Superintendent shall be binding as if given directly to the Contractor. The Contractor's Safety Manager shall visit the site on a regular basis and as necessary to ensure the safe performance of Contractor's Work.

§ 3.9.2 The Contractor's Project Superintendent shall devote his or her full time to this Project and the Contractor's Work, and shall maintain his or her offices on the Project Site. The Project Manager and Project Superintendent shall direct, coordinate, and supervise all of the Contractor's Work under its Contract and shall inspect all material and equipment delivered to the Project Site and shall cause the immediate removal from the Project Site of all non-conforming material and equipment which is under the care, custody and control of the Contractor, its Subcontractors or anyone for whose acts it is liable.

§ 3.9.3 The Contractor shall maintain temporary office and administration facilities at the Project Site, which shall be located in space shared with the Construction Manager and the other Contractors. It is anticipated that the Contractors will utilize this as an opportunity to meet informally on a regular basis to discuss the Project, and their respective portions of the Work for the Project, to plan for sequencing of their Work and to provide for cooperatively anticipating, avoiding and resolving potential unforeseen events and contingencies in order to mitigate the delay and/or cost effect of such events or contingencies.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for its Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Contractor's Work to completion and shall not exceed the then current time limits under the Contract Documents. The schedule shall be revised at appropriate

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intervals as required by the conditions of the Contractor's Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of the other Contractors, or the construction or operations of or by the Owner's own forces or Separate Contractors. The Contractor shall provide updated schedule information upon request and in a timely manner.

§ 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 Owner, Construction Manager's and Architect's approval. The Owner, Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, refer to §3.10.1, and (2) allow the Owner, Construction Manager and Architect reasonable time 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 with the other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager, for the entire Project (the "Approved Project Schedule"). The Contractor shall make revisions to its construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the schedule for the overall Project.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent construction schedules submitted to and approved by the Owner, Construction Manager, and Architect, and incorporated into the approved agreed Work schedule, for the performance of the Contractor's Work ("Approved Work Schedule"), and the Contractor's submittal schedule, and provide monthly updating thereof showing progress in its Work in comparison to the time limits current under the Contract Documents. As part of their efforts regarding the adoption and implementation of Lean Procedures, it is anticipated that the Contractors will work in a coordinated manner in the development and implementation of their respective Approved Work Schedules to sequence and coordinate their respective Work so as to minimize delay and the cost of re-handling of materials and equipment, and to anticipate, avoid and resolve potential unforeseen events and contingencies in order to mitigate the delay and/or cost effect of such events or contingencies.

§ 3.10.5 The Contractor shall prepare for presentation at each regular construction meeting with the Owner, Construction Manager and Architect an activity look-ahead schedule delineating the construction activities by Contractor planned to occur in the subsequent two weeks, and the relation of these activities to the time limits current under the Contract Documents applicable to the Contractor's Work as reflected in its Approved Work Schedule. Consistent with Lean construction principles to be utilized on the Project, the Contractors shall, with the Construction Manager, meet and confer weekly regarding the development and implementation of their respective Approved Work Schedules, and the Approved Project Schedule, to identify potential delays or obstructions, and to develop a plan of action to address them and/or to provide alternative areas within which Work can be performed while unexpected events or contingencies are being addressed.

§ 3.11 Documents and Samples at the Site

§ 3.11.1 The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Owner, Construction Manager, Architect, and Owner, and delivered in good condition in a single properly organized and compiled package to the Construction Manager and Architect for their use in preparing record documents and for submittal to the Owner upon completion of the Contractor's Work and before final payment is made under its Contract to the Contractor as a record of the Contractor's Work as constructed.

§ 3.11.2 Record drawings shall be kept clean, and notations shall be made on them using clear, concise drafting techniques acceptable to the Architect.

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§ 3.11.3 The Contractor shall also maintain at the Project Site for availability to the Owner, Construction Manager and Architect, all inspection reports and other written communications relating to is Work between and among the Architect, Construction Manager, Contractor and its Subcontractors, Sub-subcontractors, materials suppliers, etc.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for its 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 its Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Contractor's 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 its Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of §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 such Contract Documents, in accordance with **the Project** their submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Contractor's Work or in the activities of the 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 the other Contractors.

§ 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 its Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of its Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal thereof has been reviewed and approved by the Architect.

§ 3.12.8 The Contractor's 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 its 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 its Work or unless the Contractor needs to provide such services in order to carry out the Contractor's

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responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 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 and who has and shall maintain professional liability insurance of no less than $2,000,000. 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 action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that its Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Owner, Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine its 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 Project Site with materials or equipment.

§ 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 Project Site. The Contractors shall meet and confer with the Construction Manager and each other no less than weekly regarding the coordination and planning of delivery and storage of their materials and equipment, and develop coordinated plans to enable each of the Contractors to minimize the need for advance delivery and storage of materials and equipment, and render more efficient the ordering and delivery of such materials and equipment to minimize handling and maintenance before staged for use in the performance of the Work of the respective Contractors at the Project Site.

§ 3.13.3 The Contractor and all of its Subcontractors and Sub-subcontractors shall keep their respective employees out of any areas that are not necessary for actual performance of the Contractor's Work.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete its Work or to make its parts and portions fit together properly as reasonably consistent with the requirements or information contained in the Contract Documents. 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 its own Work or fully or partially completed construction of the Owner, Separate Contractors, or of the 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 Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Contractor's Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of stored materials, stored waste materials and stored rubbish caused by operations or activities under or related to the Contractor's

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Contract. At completion of its Work, the Contractor shall remove all items including, but not limited to, waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials of the Contractor's and/or its Subcontractors and Sub-subcontractors from and about the Project.

§ 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 therefor from the Contractor. In the event that clean-up is due to one or more Contractors, the Owner shall apportion the costs among the responsible Contractors.

§ 3.15.3 The Contractor shall be responsible for all glass broken by its own forces or its Subcontractors and Sub-subcontractors and, at and before completion of its Work, as directed by Owner, shall replace such damaged or broken glass. After such broken glass has been replaced, the Contractor shall remove all labels, wash, and polish both sides of all glass. Further, in addition to general broom cleaning of its Work site, the Contractor shall perform the final cleaning for all trades involved with the Contractor's Work immediately upon completion of its Work, which shall include, but not be limited to, the following: (a) remove temporary protections; (b) remove marks, stains, fingerprints and other soil or dirt from painted, decorated, and natural-finish woodwork and other portions of its Work; (c) remove spots, mortar, plaster, soil and paint from ceramic tile, marble, and other finish materials and wash or wipe clean; (d) clean fixtures, cabinet work and equipment, removing stains, paint, dirt, and dust and leave in undamaged, new condition; (e) clean aluminum in accordance with recommendations of the manufacturer; and (f) clean resilient floors thoroughly with a well-rinsed mop containing only enough moisture to clean off any surface dirt or dust and buff dry by machine to bring the surfaces to sheen.

§ 3.15.4 Costs incurred by Owner under this § 3.15 shall be deducted from any amounts otherwise due to the Contractor under its Contract, or at Owner's option, reimbursed by Contractor to Owner immediately following Owner's demand.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to its Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees relating to its Contract and the Work thereunder. The Contractor shall defend all suits or claims for infringement of any copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from any loss on account thereof, (including but not limited to, attorney's fees and any litigation costs and expenses), but shall not be responsible for defense or loss resulting 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 promptly advise the Architect and Owner through the Construction Manager, in the absence of which timely notice the Contractor shall be responsible for such defense or loss.

§ 3.18 Indemnification

§ 3.18.1 The Contractor agrees to indemnify and defend and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them (collectively "Indemnitees" or individually "Indemnitee") from and against any and all claims, demands, causes of action, damages, liabilities, losses, and/or expenses, including, without limitations, attorneys' and consultants' fees, and related costs and expenses attributable to any

- **.1** bodily injury, sickness, disease or death,
- **.2** injury to or destruction of tangible property (other than the Contractor's Work itself), including the loss of use resulting from herein:
- **.3** governmental fines and/or penalties arising out of the performance of the Contractor's Work;
- **.4** corrective measures required under the Federal Occupational Safety and Health Act (hereinafter referred to as OSHA);
- **.5** delay in completion of the Contractor's Work beyond the Contract Time therefor, as defined in Article 8, caused by proceedings under OSHA;
- **.6** any and all damages, costs and expenses associated with any delay, hinderance or impact to the work of other Contractors; and

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.7 Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this § 3.18. This indemnification agreement shall be applicable, and the Indemnitees shall be indemnified, regardless of whether or not such claim, demand, cause of action, damage, liability, loss or expense is caused in whole or in part by an Indemnitee, subject to the terms of § 3.18.3 or § 3.18.4.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, a Sub-subcontractor, materialman or supplier, or anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under § 3.18.1 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 or other such employer under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.18.3 The Contractor shall defend each Indemnitee, through counsel approved by such Indemnitee or the majority of such Indemnitees (if applicable), in any action, proceeding, or arbitration brought against the Indemnitee(s) by reason of any such claim described in this § 3.18. The Contractor's obligation to defend an Indemnitee shall not (a) extend to any action, proceeding, or arbitration that asserts or alleges only that the injury to the claimant resulted solely from the negligence or willful misconduct of the Indemnitee, and from no other cause, although the Contractor shall be responsible for all attorneys' fees, costs and expenses relating to the defense of the Indemnitee(s) in the event it is not determined that such injury is solely caused by the negligence or willful misconduct of the Indemnitee(s), or (b) if a final judgment is obtained establishing that the claim for which indemnity is sought resulted solely from the negligence or willful misconduct of the Indemnitee, in which latter event Contractor's obligation to defend the Indemnitee shall cease upon the date such judgment becomes final, and the Indemnitee shall thereupon and thereafter reimburse Contractor for its reasonable attorneys' fees and court costs in so defending the Indemnitee.

§ 3.18.4 If any claim any other demand for payment or security therefor, including claims or demands upon performance and payment bond sureties for the performance of the Contractor under its Contract, is made or filed with the Owner or the Property, by any person claiming that the Contractor or any Subcontractor, Sub-subcontractor or supplier or any other person claiming under them or any of them has failed to properly and timely perform its contractual obligations or to make payment for any labor, services, trust fund contributions, materials, equipment, taxes, or other items furnished or obligation incurred for, or in connection with the Contractor's Work, or if at any time there shall be evidence of such non-performance or nonpayment of any claim or other demand for which, if established, the Owner or Property might become liable, and provided that the Owner has previously paid Contractor for the Contractor's Work for which the claim or other demand for payment has been made (less the applicable retainage, and unless Owner is otherwise permitted to withhold such payment in accordance with the terms of § 9.5.1), then the Owner shall have the right to retain from any payment then or thereafter due under the Contractor's Contract or, at the Owner's sole option, to be promptly reimbursed by the Contractor upon demand for an amount sufficient to (i) satisfy, discharge, and defend against any such claim or other demand, or any action or proceeding thereon that may be brought to judgment or award, (ii) make good any such nonpayment, nonperformance, damage, failure, or default; and (iii) compensate the Owner for and indemnify it against any and all losses, liabilities, damages, costs and expenses (including attorneys' and consultants' fees and costs) sustained or incurred in connection therewith.

§ 3.18.5 In the event that the Contractor fails or refuses to indemnify any Indemnitee hereunder, in addition to all other obligations and upon an adjudication in favor of an Indemnitee, the Contractor shall be responsible for all costs associated with the enforcement of these indemnification obligation including all attorneys' and expert fees and costs.

§ 3.19 Meetings

The Contractor shall send its qualified representative to periodic meetings or web meetings at the option of the Owner relating to the Project and/or Contractor's Work held at such time and at such place as the Architect, Construction Manager or the Owner shall designate. Prior to and in anticipation of such meetings, the Contractors, with the Construction Manager, shall meet and confer about the activities on the Project Site and the progress of the Project, and discuss ways to maintain and improve the progress of the Project and anticipate potential delay events, obstructions or other contingencies that might affect the Approved Project Schedule and their respective efforts on the Project Site.

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§ 3.20 Default

§ 3.20.1 The Contractor shall be in default of its Contract, and its duties and obligations thereunder, if:

.1 Contractor becomes insolvent, is adjudged bankrupt, or makes a general assignment for the benefit of its creditors, or becomes subject of any proceeding commenced under any statute or law for the relief of debtors, but only to the extent permitted by law; or

.2 a receiver, trustee or liquidator of any of the property or income of the Contractor shall be appointed, but only to the extent permitted by law; or

.3 Contractor refuses or fails to prosecute its Work in accordance with the applicable Contract Documents; or

.4 Contractor refuses or fails to timely supply enough properly skilled workers or proper material; or

.5 Contractor fails to make proper payment when due to Subcontractors or otherwise for materials or labor under its Contract in accordance with the respective agreements between the Contractor and the Subcontractors (provided Owner shall have paid to Contractor any payments due from Owner in connection with such materials or labor, subject to the other provisions of the Contract relating to the right of the Owner to withhold payment); or

.6 Contractor fails to coordinate its Work with the other Contractors, and its Subcontractors as required under Article 6; or

.7 Contractor fails to timely comply with the scheduling requirements of its Contract as set forth in § 3.10 and elsewhere as they may appear throughout its Contract, including under its Approved Work Schedule and the Approved Project Schedule; or

.8 Contractor fails to promptly replace rejected material or correct rejected workmanship; or

.9 Contractor fails to observe any other terms, provisions, conditions, covenants, and agreements set forth in its Contract and the Contract Documents to be observed and/or performed on the part of the Contractor.

§ 3.20.2 In the event of any default by Contractor under its Contract, Owner shall have the right to terminate such Contract in accordance with § 14.2, in addition to any and all other remedies that Owner may now or hereafter have against the Contractor under its Contract, the Contract Documents, at law and/or at equity.

§ 3.21 Services and Responsibilities of Contractor

Contractor's services under its Contract consist of all services to be performed and rendered by the Contractor under and pursuant to its Contract and the Contract Documents.

§ 3.22 Lean Procedures

§ 3.22.1 Owner desires to implement procedures advocated by the Lean Construction Institute (collectively, the "Lean Procedures") as applicable to the activities of the Architect, Construction Managers and Contractors. Each of the Contractors shall cooperate with Architect, Construction Manager and other Contractors to assist the Construction Manager in the establishment and implementation of these procedures. Specific requirements for collaboration are also included in various locations throughout these General Conditions.

§ 3.22.2 In addition to all other duties and responsibilities of the Architect, Construction Manager and Contractors as set forth on these General Conditions and in their respective Contracts with the Owner, the following are a listing of some of the other activities to be implemented for the Project, in addition to those stated elsewhere in these General Conditions:

.1 "Last Planner System" (LPS) using Pull Scheduling and Percent Planned Complete (PPC) Tracking: The project will utilize the Last Planner System to develop and implement the detailed work plans for each phase of the project based on the master project schedule. Pull Plans and Percent Planned Complete (PPC) tracking will be utilized on the project. Contractor will actively participate in weekly work planning meetings to review past, current, and future work activities. Contractor shall attend pull planning meetings at the request of Construction Manager To implement the LPS effectively, it is critical for the Contractor's foremen to participate in all planning sessions and have necessary authority to make decisions on manpower, equipment, materials and other required resources to ensure commitments are met. Contractor's foremen shall attend training, provided by the Construction Manager, to orient to this system. Contractor/Supplier shall understand that the Construction Manager

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will be tracking major "promises made" on the Project via a reliable promising matrix. All "promised" tasks shall be tracked in the matrix with a task description, Contractor/Supplier responsible, and promised completion date. The Construction Manager will provide Contractor/Supplier feedback on their reliable promising performance during weekly Foreman's meetings. Overall PPC ratings will be provided to each Contractor/Supplier at the end of the project.

.2 Daily Huddle: The project will have Daily Huddle with all contractors to coordinate with one another, the meetings will be held in person, and should be held at a consistent time; ideally at the beginning, end or during a natural break in the day. Additionally, the huddles should be brief, generally not exceeding 15 minutes. However, the period/frequency of the meetings can be adjusted to meet the needs of the team and the project.

.3 Materials Management: Minimize the amount of materials being stored at the Project Site for extended periods of time through efficient scheduling, and to eliminate unnecessary handling or relocation. Contractor/Supplier shall consent that all material deliveries to the jobsite not already included in a prefabricated assembly, are to be "kitted" specific to their purpose. All "kit" deliveries must be labeled with Subcontractor's name, delivery date, and location to be installed. Contractors shall reference the project-specific logistics guidelines for material delivery and storage requirements.

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, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will advise and consult with the Owner and Construction Manager. The Construction Manager and the Architect in cooperation and coordination with one another, will each provide such administration of the Contract and Project as described in the Contract Documents in these General Conditions, and in their respective Contracts with the Owner for the Project during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent expressly provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site regularly, no less than once every two weeks during the period of Pre-construction, Construction and Close-out of the Project, or as otherwise agreed with the Owner, to become generally familiar with, and review the progress and quality of the portion of the Work completed, 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.

§ 4.2.3 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 such Work, and will promptly report to the Owner and Architect any known deviations

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from the Contract Documents and the most recent Approved Project Schedule, and defects and deficiencies observed in the Contractor's Work.

§ 4.2.4 The Construction Manager will be responsible for the preparation and update of the overall Project schedule based upon input from the Contractor and other contractors. It shall be the obligation of the Contractor to schedule and coordinate its activities and to cooperate and coordinate with other contractors and Construction Manager so as not to delay the Project schedule or impede the work of others.

§ 4.2.5 The Construction Manager, except to the extent required by §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 Contractor's 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 unless the same results from a written directive from the Architect to the Contractor. 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, Sub-subcontractors or their agents or employees, or of any other persons or entities performing any portions of the Contractor's Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. 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, Sub-subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor with respect to its Work , in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about such rejection. Whenever the Construction Manager considers it necessary or advisable, the 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 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 the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either 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 or the Construction Manager to the Contractor, Subcontractors, Sub-subcontractors, suppliers, their agents or employees, or other persons performing any of the Contractor's Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect and Construction Manager for approval.

§ 4.2.10 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 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 for dissemination to the Contractor.

§ 4.2.11 Receipt and/or 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

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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 receipt and/or review of the Contractor's submittals shall not relieve the Contractor of the obligations under §3.3, 3.5, and §3.12. The Construction Manager and Architect's receipt and/or 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.

§ 4.2.12 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.13 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 §9.8; and receive and forward to the Owner written warranties and related documents required by the each Contract for the Project and assembled by the respective Contractors pursuant to §9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents for the Project on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished, then the Architect's response shall be made within a reasonable time. Work which does not conform to the Architect's interpretations shall be nonconforming work subject to the provisions of Article 12.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 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.

§ 4.2.21 The Construction Manager will receive requests for information from the Contractor, and forward each request for information to the Architect, 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 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.

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ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with ~~the~~ a Contractor to perform a portion of the Work at the Project Site. The term "Subcontractor" is referred to throughout the Contract Documents for the Project as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include the other Contractors or Separate Contractors or the subcontractors of other 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 to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents for the Project 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 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the 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. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 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 nor enter into any subcontract to which 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. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 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.

§ 5.3 Subcontractual Relations

§ 5.3.1 All portions of the Contractor's Work that the Contractor's organization does not perform with its own personnel shall be performed under the Subcontracts or by other appropriate agreements with the Contractor. 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 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.

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§ 5.3.2 Any part of the Contractor's Work performed for the Contractor by a Subcontractor shall be pursuant to a written Subcontract between the Contractor and such Subcontractor, which, the Contractor has submitted to the Owner for its information. Each such Subcontract shall contain provisions that:

.1 informs the Contractor of any and all Sub-subcontractors of the Subcontractor;

.2 require that the Work to be performed thereunder be in accordance with the requirements of the Contract Documents;

.3 fully disclose the payment provisions under Article 5 of the Contract, and Article 9 of the General Conditions, and requires timely submission of applications for payment under each Subcontract in reasonable time to enable the Contractor to apply for payment in accordance with the provisions of the Contractor's Contract;

.4 waive all right the subcontracting parties may have against one another or that the Subcontractor may have against the Owner for damages caused by fire or other perils covered by the property insurance described in §11.3, except for such rights as they may have to the proceeds of such insurance held by the Owner as trustee under §11.3.8;

.5 obligate each Subcontractor, at Owner's sole election, to continue to perform under its Subcontract in the event the Contractor is terminated, and Owner takes an assignment of said Subcontract, with Owner's liability thereunder to accrue only after such assignment;

.6 require the Subcontractor to carry and maintain insurance in accordance with the requirements of the Contract Documents;

.7 obligate the Subcontractor to specifically acknowledge and consent to the provisions of Article 8 wherein it states that all time limits in the Contract Documents are critical;

.8 require each Subcontractor to fully cooperate in order to permit the Owner to conduct Owner's Operations at the Property without interruption;

.9 require each Subcontractor to fully cooperate with the testing representatives of Owner and Contractor on the Project Site;

.10 require each Subcontractor, Sub-subcontractor and supplier to obtain prior written approval of Owner prior to the publication of any promotional material regarding the Work to be performed by or on behalf of the Contractor;

.11 preclude any right or entitlement to a Change Order for an adjustment in either the Subcontract sum or the Subcontract time for an error in the Contract Documents applicable to the Contractor's Work if the Subcontractor should reasonably have known of or anticipated the error giving rise to such requested Change Order;

.12 preserve and protect the rights of Owner under the Contractor's Contract with respect to its Work to be performed under the Subcontract so that the subcontracting thereof will not prejudice such right;

.13 include the Subcontractor's acknowledgment that Contractor has assigned its interest in the Subcontract to Owner, which assignment shall become effective only upon Contractor's default under the Contract Documents applicable to the Contractor's Work and Subcontractor's receipt of notification from Owner that (a) Contractor is in default under the applicable Contract Documents or Owner has terminated the Contractor's Contract; and (b) the assignment of the Subcontract is effective;

.14 require that all claims for additional costs, extensions of time, damages for delays or otherwise with respect to subcontracted portions of the Contractor's Work shall be submitted to the Contractor (via any Subcontractor or Sub-subcontractor where appropriate) in sufficient time so that the Contractor may comply in the manner provided in the Contract Documents for like claims by Contractor upon Owner;

.15 limit the amount which the Subcontractor may charge for overhead and profit in connection with a change in the Contractor's Work to the amounts set forth in Article 7 and

.16 contain no provisions inconsistent with any of the foregoing Subparagraphs of this §5.3.2.

§ 5.3.3 As required by § 5.2.5, the Contractor shall at all times maintain a current list of all Subcontractors, Sub-subcontractors and suppliers performing any of Contractor's Work which it shall provide to the Owner as set forth in § 5.2.5.

§ 5.3.4 All Subcontractors, Sub-subcontractors and suppliers shall waive and release any claims, causes of action or rights against Owner for property damage caused by fire or other casualties or perils for which such Subcontractor, Sub-subcontractor or supplier is or, under the terms of the Contractor's Contract, should have been insured.

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§ 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 §14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract as of the effective date of such assignment.

§ 5.4.2 Upon assignment to the Owner under §5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

§ 5.5 Payments to Subcontractors by the Contractor

§ 5.5.1 The Contractor shall promptly pay each Subcontractor, materialman, supplier or any other person whom the Contractor has contracted or who is employed directly or indirectly by the Contractor on the Project, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's or other party's portion of the Contractor's Work, the amount to which said Subcontractor or other party is entitled, less the percentage retained by Owner from the payment to the Contractor. The Contractor shall, by an appropriate agreement with each Subcontractor, materialman, supplier or other person, require them to make payments to their Sub-subcontractors, materialmen and suppliers in similar manner.

§ 5.5.2 The Contractor shall defend, indemnify and hold harmless the Indemnitees from and against all claims, demands, damages, losses and expenses, including without limitation, any attorneys' fees, costs and expenses paid or incurred by Indemnitees in connection with the settlement or defense of any such claims, arising out of or in connection with the failure of Contractor to pay a Subcontractor, materialmen, supplier or any other person with whom Contractor has contracted or who is employed directly or indirectly by Contractor provided Contractor has been paid by Owner all sums due for any portion of the Contractor's Work.

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 with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the General Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 Each 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 Contractor's Work, promptly notify the Construction Manager and Architect of apparent

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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. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for all costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in §10.2.5 and the Contractor shall indemnify, defend and hold the Owner harmless from any claims or damages brought by another Contractor arising out of any actions or omissions of the Contractor in performing its Work pursuant to its Contract.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in §3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and 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.

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.

§ 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, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager 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.

§ 7.2.1 Methods used in determining adjustments to the Contract Sum may include those listed in § 7.3.3.

§ 7.2.2 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Contractor's Work which 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 Contract Time applicable thereto.

§ 7.2.3 Notwithstanding anything set forth herein to the contrary, Contractor shall not be entitled to a Change Order for an adjustment in either the Contract Sum or the Contract Time for an error in the Contract Documents if the Contractor should reasonably have known of or anticipated the error giving rise to such requested Change Order.

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The preceding sentence shall not be construed to mean that the Contractor has assumed any of the Architect's responsibilities or any of the responsibilities of any engineer retained by the Architect or retained directly by the Owner with respect to the Project.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager 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 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, including a breakdown for each trade giving separation of material, equipment and labor, providing quantities and labor hours as outlined in § 7.3.3.3. The fee payable to the Contractor, Subcontractor or Sub-subcontractor shall be the same as permitted in § 7.3.3.3;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon; or

.3 On a time and material basis by cost (as defined in § 7.3.3.3(d)), plus a percentage fee which shall be established as follows:

(a) For extra work performed by the Prime Contractor, the Owner shall pay Prime Contractor cost of the work (materials, equipment & labor) plus 5% markup which is inclusive of all overhead and profit. For change orders in which there are multiple tiers of subcontractors and/or supplier, as noted in § 7.3.3.3 (b) and (c), the total mark- up shall not exceed 10%. Change order markup percentages are inclusive of all allowable Overhead and Profit; Overhead and profit shall be inclusive of the following: home office costs, management supervision (field & office), training, vehicles and pickups, fuel, safety, travel, reproduction, temporary facilities, computers, office equipment, small tools, and other incidentals. Small tools are defined as tools that do not have a new unit cost in excess of $750.00.

(b) For extra work performed by a Subcontractor or equipment supplier, the charges to Owner shall include the Subcontractor's cost, plus a fee (payable to the Subcontractor) in an amount equal to 5% of such cost.

(c) For extra work performed by a Sub-subcontractor, the charges to Owner may include: the Sub-subcontractor's cost, plus a fee (payable to the Sub-subcontractor) in an amount equal to 5% of such cost. The aforementioned percentages shall apply unless the Contractor and Owner agree to modify same in writing.

(d) "Cost" shall consist exclusively of the actual cost of those expenses for which reimbursement is permitted under § 7.3.7. Cost shall not include any provision for the cost of Contractor's supervision, overhead, profit, and any other general expenses, except as expressly provided under § 7.3.3.3 (a) above.

(e) The Contractor shall furnish satisfactory bills, payrolls, vouchers, and other supporting documentation covering all items of cost, and when requested by Owner, shall give the Owner access to accounts relating thereto.

(f) The Contractor shall provide detailed labor rate breakdowns to support change order labor rates. The Owner and/or will provide the labor rate breakdown forms that shall be completed a submitted for each trades classification no later than 20 days from Notice To Proceed. The labor rates shall be consistent with prevailing wage rates inclusive of burdens, insurances and allowable mark up.

(g) The value of work added and deleted for each item of Work shall be computed on the net difference in quantity.

(h) The fees payable to the Contractor, Subcontractors and Sub-subcontractors under § 7.3.3.3(a), § 7.3.3.3(b), § 7.3.3.3(c) and § 7.3.3.3(d) shall constitute the total reimbursement and payment to be made to the Contractor, Subcontractors and Sub-subcontractors on account of supervision, overhead, profit, and other general expenses relating to any change in the Work under the Contractor's Contract.

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The Contractor shall provide the Construction Manager will all documentation requested by the Construction Manager in order to determine costs. In no case shall the Contractor include more than 10% mark-up on material, subcontractor work or other incurred cost plus 5% for Overhead and Profit including any and all fees.

§ 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 the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. 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 the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 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 Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 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 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, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. 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.

§ 7.4 Minor Changes in the Work

The Architect may 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

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for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. 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.

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 the Substantial Completion of the Contractor's Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Contractor's Contract with the Owner.

§ 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 Contract with the Owner, the Contractor confirms that the Contract Time there in is a reasonable period for performing its Work.

§ 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 to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 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, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather 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 pending mediation and binding dispute resolution; 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 for such reasonable time as the Owner may determine. Nothing herein shall be construed to allow the Contractor to recover time or money in connection with any delay, disruption or impact arising out of Contractor's negligence.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

§ 8.4 Delay

.1 "Excusable/Non-compensable" Delay means any delay of the completion of the Contractor's Work beyond the expiration of the Contract Time therefor which could not have reasonably been anticipated and is caused by conditions beyond the reasonable control and without the fault or negligence of the Contractor, such as strikes, embargoes, or unavoidable casualties, unusual delays in transportation, complete shutdowns due to a pandemic, during which the Contractor's Work cannot continue. The financial inability of the Contractor or any of its Subcontractors or Sub-subcontractors and any default of any of its Subcontractors or Sub-subcontractors, without limitation, shall not be deemed conditions beyond Contractor's control. An Excusable/Non-compensable Delay may entitle the Contractor to an extension of the Contract Time applicable to its Work in accordance with § 8.3 but shall not entitle Contractor to any adjustment of the Contract Sum therefor.

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.2 "Excusable/Compensable Delay" means any delay of the completion of the Contractor's Work beyond the expiration date of the Contract Time therefor, based on impact to the critical path of the Approved Work Schedule for such Work, caused by the gross negligence or willful act of the Owner, Construction Manager or Architect or of an employee of either or of another Contractor, or by changes ordered in the Contractor's Work, which delay completion of such Work unreasonably under the circumstances involved and not within the contemplation of the parties. A Compensable Delay may entitle the Contractor to an extension of the Contract Time and/or an adjustment of the Contract Sum for its Work, in accordance with § 8.3. Except as expressly provided herein, the Contractor shall have no claim or right to assert a claim for an adjustment of the Contract Sum and/or the Contract Time, or for damages or compensation for any delay, interruption, hindrance, or disruption of its Work.

.3 "Inexcusable Delay" means any delay of the completion of the Contractor's Work beyond the expiration of the Contract Time therefor resulting from causes other than those listed in § 8.1.5.1 and § 8.1.5.2 above. An Inexcusable Delay shall not entitle Contractor to an extension of the Contract Time or an adjustment of the Contract Sum for its Work.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Contract and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Contractor's 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

Where the Contract is based on a stipulated sum , the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall not be front-loaded. 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. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under §9.2, for completed portions of its Work. The application shall be fully executed by an authorized agent of the Contractor, notarized, 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, Certified Payroll documentation and releases of waivers of lien from the Contractor, Subcontractors, Sub-subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 Each Application for Payment by the Contractor for its Work shall be supported by the following documentation, each in a form satisfactory to the Owner:

.1 Contractor's release of liens and claims in the form attached to its Contract as Exhibit D.

.2 Subcontractor certificates, statements and affidavits showing that the Contractor's Work covered by said Application for Payment has been performed and delivered free of liens.

.3 Subcontractors' release of liens and claims in the form attached to the Contractor's Contract as Exhibit D, and as reasonably required by the Owner, lien and claims releases from their Subcontractors, materialmen and suppliers.

.4 Statement of Account, indicating the Subcontract amounts, monies paid to date and monies due Subcontractors for Contractor's Work performed on the Project.

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.4 Contractor's Monthly Progress Report for its Work.
.5 Monthly update of cash flow projection to final completion of the Contractor's Work.
.6 Such other documents in form, scope and substance as the Owner or the applicable Contract Documents shall require for disbursement of funds.

§ 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 The Owner and Contractor acknowledge and agree that an Application for Payment for the Contractor's Work shall not be deemed invalid or unsatisfactory for the sole reason that any lien waiver or release as Owner may require pursuant to §9.3.1.1.3 shall be in a form that purports to make the waiver or release conditioned upon the receipt of payment for the Contractor's Work for which Application for Payment has been submitted.

§ 9.3.1.4 The initial payment by the Owner to the Contractor on account of the Contractor's Work performed by its individual Subcontractors shall be conditioned upon the Owner's prior receipt of the following documentation:

.1 The fully executed Subcontract;
.2 the Subcontractor's approved Certificate of Insurance (original);
.3 the Subcontractor's approved Schedule of Values;
.4 the Subcontractor's fully executed release of liens and claims form; and
.5 such other documentation as the Owner may from time to time require.

§ 9.3.2 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. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 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.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a 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; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

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§ 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; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or 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 Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, 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 Application for Payment or 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 Contractor is, or 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 an evaluation 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 Owner, 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 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 9.4.1 and 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 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;

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.6 reasonable evidence that the Work will not be completed 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 repeated failure to carry out the Work in accordance with the Contract Documents.

.8 failure to submit timely schedule updates or recovery within the time designated by the Construction Manager or acceptable to the Construction Manager.

§ 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.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld. In no event may the Contractor stop performing Work in connection with a good faith dispute.

§ 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. Nothing herein shall require the Owner to issue joint checks.

§ 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.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor 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.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, 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.

§ 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, except as may otherwise be required by law.

§ 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 The 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, 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 from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any claim for payment by any Subcontractor or supplier of any tier. Upon

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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 the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven 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 appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in 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 so the Owner can occupy or utilize the Work for its intended use. The Work will not be considered suitable for Substantial Completion review until all Project components included in the area of the Work are operational as design and scheduled, all designated or required governmental inspections and certifications, including certificates of occupancy, have been made and posted. In general, the only remaining Work shall be minor in nature, so that the Owner can occupy the potion of the building on that date for its intended use and the completion of the Work of the Contractor would not materially affect, or hamper the normal business operations or intended use of the Owner.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment ("punch list"). 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. The Owner shall be entitled to withhold one and one-half times the value of the items on the punch list until they are completed or corrected.

§ 9.8.3 Upon receipt of the punch list, the Architect, assisted by the Construction Manager, will 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 list, 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.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, 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 list 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.

§ 9.8.5 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. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 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

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to by the insurer and authorized 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 and Construction Manager shall jointly prepare and submit a list to the 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.

§ 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 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.

§ 9.10 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, 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. As a condition to final payment, Contractor shall assemble and provide to the Owner all warranties and manuals in the media and format acceptable to the Owner.

§ 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 (6), 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; (7) final as-built prints of record drawings marked by the Contractor with record information as set forth in the Contract Documents. 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 be compelled to 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

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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.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment; or.
- **.5** latent failure of the Contractor to comply with the requirements of the Contract Documents; or
- **.6** insurance and indemnity obligations hereunder.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee.

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 safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct 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 and not directly employed by the Construction Manager. The Owner assumes no responsibility or liability for the safety of the Project site.

§ 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 and other persons who may be affected thereby;
- **.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; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 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.

§ 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 exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 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

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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.

§ 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.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party as soon as possible, but not later than 48 hours after the incident. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 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 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 as soon as possible, but no later than 24 hours after the discovery.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the 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. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the 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 and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and 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 in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, 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 due to the fault or negligence of the party seeking indemnity.

§ 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. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 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.

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§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain, during the life of its Contract and for the period thereafter as required in the Contract Documents applicable to the Contractor's Work (but no less than three years), in a company or companies acceptable to the Owner and lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor and any additional insured thereunder from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit, employer's liability and other similar employee benefit acts which are applicable to the Contractor's Work to be performed, including, without limitation, private entities performing such Work at the Project Site and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Contractor's Work;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees or persons or entities excluded by the statute from the requirements of § 11.1.1.1 but required by the Contract Documents applicable to the Contractor's Work to provide the insurance required by that Section;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Contractor's Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- **.7** Claims for bodily injury or property damage arising out of completed operations (including for the three year period following Final Payment to the Contractor for its Work); and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under § 3.18.

§ 11.1.2 The insurance required by § 11.1.1 shall be written for the greater of the limits of liability specified in the Contract Documents or those required by law. Coverages shall be written on an occurrence basis (unless otherwise specifically noted), shall be maintained without interruption from the Date of Commencement of the Contractor's Work until the date of Final Payment to the Contractor and, as applicable, termination of any coverage required to be maintained after Final Payment and, with respect to the Contractor's completed operations coverage, for a term of three (3) years after Final Payment to the Contractor for its Work.

§ 11.1.3 Certificates of insurance and copies of all insurance policies with endorsements evidencing the insurance required to be provided by the Contract in form 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 Contractor's Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this § 11.1 shall contain a provision that coverages afforded under the policies will not be canceled, reduced or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment of the Contractor as required by § 9.10.3 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by § 11.1.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness.

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Upon receipt of any notice of cancellation or alteration, Contractor, within ten (10) days, shall procure other policies of insurance, similar in all respects to the policy or policies, about to be canceled or altered; and, if Contractor fails to provide, procure and deliver acceptable policies of insurance or satisfactory evidence thereof, in accordance with the terms hereof, then at Owner's option, Owner may obtain such insurance at the cost and expense of, and back charge, the Contractor, without the need of any notice to Contractor.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include and designate (1) the Indemnitees as additional insureds (except that such insurance shall contain a limitation that the policy will not insure the Architect against the Architect's liability arising out of the acts or omissions described in § 3.18); and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.1.5 All insurance to be carried by Contractor hereunder shall state, by endorsement, that Contractor's insurance is primary and that any liability insurance maintained by Owner or any other additional insured is excess and non-contributory. Contractor shall not commence its Work under its Contract until it has obtained all insurance required hereunder and certificates of insurance and copies of all policies and endorsements evidencing such insurance have been submitted to and approved in writing by Owner. Contractor shall not allow any Subcontractor to commence the Contractor's Work until such Subcontractor has obtained insurance as required pursuant to the Contract Documents applicable thereto.

§ 11.1.5 In the event of any inconsistency between the requirements of this § 11.1.5 and the provisions of Article 8 of the Contractor's Contract, the provisions of such Contract shall govern and prevail.

§ 11.2 Owner's Liability Insurance

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

§ 11.3 Property Insurance

§ 11.3.1 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 the value of subsequent Contract modifications and cost of materials supplied or installed by others, plus the value of the contents of the entire Project during construction and when completed and occupied, comprising total value for the entire Project at the Project Site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents for the Project 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 § 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this § 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Contractor's Work.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, glass breakage, 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.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires minimum deductibles, and such deductibles are identified in the Contract Documents applicable to the Contractor's Work, the Owner shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles above the amounts so identified or if the Owner elects to purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for

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payment of the additional costs not covered because of such increased or voluntary deductibles. If deductibles are not identified in the applicable Contract Documents, the Owner shall pay all costs not covered because of deductibles.

§ 11.3.1.4 The Contractor shall provide insurance coverage for portions of the Contractor's Work stored off the Project Site, after receipt of written approval from the Owner, at the value established in the approval, and also for portions of the Work in transit and all materials stored at the Project Site and to be subsequently incorporated into the Work until covered by the Owner's insurance.

§ 11.3.1.5 Partial occupancy or use in accordance with § 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 (with respect to its Work) 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.

§ 11.3.2 Boiler and Machinery Insurance. If applicable, the Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential damages due to fire or other hazards to the extent of recovery under any policy pursuant to this clause.

§ 11.3.4 Waivers of Subrogation. To the extent of any insurance proceeds actually received, the Owner and the Contractor waive all rights against (1) each other and any of their Subcontractors, Sub-subcontractors, agents and employees each of the other, and (2) the Construction Manager, Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages to the Contractor's Work caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this § 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary in good faith. The Owner shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, the Contractors and the Subcontractors, Sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. Notwithstanding anything set forth herein to the contrary, this waiver shall only be effective with respect to any loss or damage occurring during such time as the appropriate policy of insurance shall contain a clause to the effect that the waiver shall not affect said policy or the right of any insured to recover thereunder.

§ 11.3.5 A loss insured under the property insurance shall be adjusted by the Owner in good faith and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of § 11.3.7. The Contractors shall pay their respective Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.6 The Owner shall deposit in a separate account insurance proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Contract between the Owner and any of the Contractor, as applicable. If after such loss no other special agreement is made and unless the Owner terminates the Contractor's Contract for convenience, replacement of damaged property shall be covered by appropriate Change Order.

§ 11.3.7 The Owner shall have power to adjust and settle any loss with insurers.

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§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 Each of the Contractors shall furnish surety bonds covering faithful performance of their respective Contracts and payment of all obligations arising thereunder as stipulated in the bidding requirements and as specifically required in the Contract Documents applicable to the Contractor's Work on the date of execution of the Contract. The Owner and Lender (if any) shall be dual obligees on any such bonds. Such bonds shall cover the faithful and full performance of the Contractor's Contract, the payment of all obligations arising thereunder, and the lien-free completion of such Contract and the Contractor's Work. The surety company issuing such bonds shall be duly licensed as such in the Commonwealth of Pennsylvania. Such bonds shall provide "Any alterations which may be made in the terms of the Contract Documents or in the Contractor's Work to be performed thereunder, or the giving by the Obligee of any extension of time for the performance of the Contractor's Work or any other obligations under the applicable Contract Documents, or any other forbearance on the part of either the Obligee or Principal under any bond to the other, shall not in any way release the surety or the Principal from any of the obligations of the bonds, notice to the Surety of any such alteration, extension or forbearance being waived by Surety." All bonds must be provided by a surety listed on the most recent Treasury Circular 570.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under its Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.4.3 The Contractor shall deliver the required bonds to the Owner at least three days before the commencement of any of its Work by the Contractor at the Project Site.

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 or Owner'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.

§ 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.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager 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.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, 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 Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. 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. No warranty period shall relieve the Contractor of

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responsibility under the Contract Documents. Nothing herein shall be construed to be a limitation of the Owner's remedies either in law or in equity.

§ 12.2.2.2 The one-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 one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 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 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 one-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.

§ 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. The Owner's acceptance of the Work or any portion thereof that is not in accordance with the requirements of the Contract Documents shall be effective only when the Owner's acceptance is memorialized in writing and signed by an agent of the Owner authorized by law to do so.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the Commonwealth of Pennsylvania excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 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, the Contractor shall not assign the Contract as a whole without written consent of the Owner. If the Contractor attempts to make an assignment without such consent, the Contractor 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.

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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. Unless otherwise provided, the Contractor shall make arrangements for 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. The Contractor shall give the Construction Manager and Architect and Owner timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect and Owner may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. All testing required by the Contractor shall be set forth in the Specifications.

§ 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 and Owner of when and where tests and inspections are to be made so that the Construction Manager and Architect and Owner may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 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, in addition to the procedures and compensation for the Owner's and the independent testing and inspections firm's services and expenses, shall be at the Contractor's expense.

§ 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.

§ 13.4.7 Tests and inspections for the convenience of the Contractor shall be at the Contractor's expense.

§ 13.5 Interest - Intentionally Deleted

§ 13.6 Electronic Project Management Information System (PMIS)

The Owner has implemented an electronic PMIS, "e-Builder", an internet-based information and project communication system that will allow the entire project team to collaborate in a centralized and secured repository for all projects.

The Contractor shall utilize the PMIS during all phases of the project, unless directed otherwise by the Owner. All project specific correspondence, workflow processes, and documentation will be stored and routed within the PMIS. The Contractors and the Owner shall agree on file name convention of submissions in advance.

The Contractor, or those direct-employee(s) responsible, on the Project will be expected to participate in the necessary training to use the PMIS effectively. Periodic training sessions on the PMIS will be provided by the Owner. It is the responsibility of the Contractor to coordinate with the Owner regarding the training schedule and to register as designated by the Owner. Training will be provided by Montgomery County. All costs for personnel time, travel, meals, and lodging to attend the training shall be borne by the Contractor and, as such, will not be reimbursed by the Owner.

The Contractor shall obtain, at their own cost, the necessary equipment and web connections to access and utilize the PMIS. The Contractor will not incur any registration fees or licensing costs to utilize the PMIS. The Owner will

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not entertain or acknowledge any amendment requests by the Contractor for claimed inefficiencies or other costs related to the implementation and subsequent use of the PMIS.

§ 13.7 Use of Unmanned Aircraft ("UA")

If the Work involves the use of UA (Drones), and if UA use is approved by the Owner, the Contractor and those Subcontractors involved in UA use must follow all applicable federal regulations, and all state and local rules, laws and regulations. In addition, a request to operate UA must be submitted to Montgomery County's Capital Projects & Programs Director, a minimum of 48 hours prior to the planned UA usage and UA flight operations may not proceed until approval is granted in writing by the Capital Projects and Programs Director.

§ 13.8 Smoking and Tobacco Policy

Smoking and the use of tobacco are prohibited in and on all County owned or leased properties, facilities, and vehicles except for designated smoking areas. Smoking inside any building may result in the Contractor's employee being immediately and permanently removed from the site.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 60 consecutive days 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, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 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 scheduled for completion, or 120 days in any 365-day period, whichever is more, unless suspension or delay is the result of a governmental order or pandemic.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon fourteen days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, , and reasonable out-of-pocket costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 120 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.1.5 Notwithstanding anything to the contrary set forth herein, the parties agree that if the Work is stopped due to a pandemic and/or any related governmental laws, rules, declarations, regulations or guidance for whatever duration, the Contractor may not terminate the Contract and the parties shall modify the Contract Time and Contract Sum in accordance with the terms of this Agreement. Nothing herein shall require a modification of the Contract Time or Contact Sum to the extent stoppage is a result of the Contractor's failure to abide by governmental laws, rules, declarations, regulations or guidance in existence at the time of execution of the Contract. Contractor bears all risk relating to COVID-19 and compliance with governmental laws, rules, declarations, regulations or guidance in existence at the time of execution of the Contract

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§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents; or .

.5 shall institute 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 is filed against the Contractor and such petition is not dismissed within sixty (60) days from the date of said filing; or if the Contractor admits in writing, his inability to pay his debts generally as they become due, or if it makes a general assignment for the benefit of its creditors, or if a receiver, liquidator, trustee or assignee is appointed on account of its bankruptcy or insolvency; or if a receiver of all or any substantial portion of the Contractor's properties is appointed.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, 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 employment of the Contractor 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. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 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 until the Work is finished. The Owner's right to terminate the Owner-Contractor Agreement pursuant to this Subparagraph 14.2 shall be in addition to and not in limitation of any rights or remedies existing hereunder or pursuant hereto or at law or in equity.

§ 14.2.4 If the costs and damages incurred by the Owner in finishing the Work, including but not limited to, compensation for the Architect and Construction Manager's services and expenses and professional fees and expenses and other damages incurred by the Owner and not expressly waived, exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This obligation for payment shall survive termination of the Contract.

§ 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. Any suspension by the Owner for convenience does not constitute grounds for termination by the Contractor under Section 14.1.

§ 14.3.2 Subject to Section 14.1.5, the Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1, to the extent permitted in accordance with the terms of this Agreement. 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 this 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, even though the Contractor has not failed to perform any part of the Contract. Termination by the Owner under this Paragraph shall be by written notice of termination delivered to the Contractor specifying the extent of termination and the effective date.

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§ 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.

.4 proceed to complete the performance of the Work not terminated. Deliver drawings, specifications, instruments of service, warranties, operation and maintenance manuals, project closeout documents and other necessary information to the Owner.

§ 14.4.3 Upon such termination the Contractor shall recover as its sole remedy payment for Work properly performed prior to the effective date of termination as provided in the Agreement, and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions; and reasonable out-of-pocket costs incurred by reason of the termination of subcontractors, proven restocking fees and reasonable out-of-pocket demobilization costs. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated and/or unearned profits, consequential or indirect damages.

§ 14.4.4 All obligations of the Contractor under the Contract with respect to completion of the Work, including but not limited to all warranties, guarantees and indemnities, shall apply to all Work completed or Substantially Completed by the Contractor prior to a convenience termination by the Owner. Notwithstanding the above, any convenience termination by the Owner or payments to the Contractor shall be without prejudice to any claims or legal remedies that the Owner may have against the Contractor for any cause.

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 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. This section does not require the Owner to file a Claim in order to impose and set-off liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Contractor shall commence all Claims and causes of action arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified herein. The Contractor waives all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by the Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the Owner with a copy sent to the Construction Manager and Architect. 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 Claim shall identify all causes of action, basis for requested relief including all facts and events, and to the extent possible, an itemization of the claim amount including supporting documentation.

§ 15.1.3.2 Claims by the Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by written notice to the Owner. Failure of the Contractor to timely initiate a Claim in writing shall constitute an irrevocable waiver of such Claim. A statement during a meeting or that is reflected in meeting minutes, or a Change Order Request shall not constitute sufficient or timely notice of a claim.

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§ 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 in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Owner's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Owner as to Claims.

§ 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 in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 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 in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, where they were beyond a fifteen (15) year coverage for the area could not have been reasonably anticipated and had an adverse effect on the scheduled construction. The Contractor shall anticipate adverse weather delays in all-weather dependent activities.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This waiver includes damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This waiver is applicable, without limitation, to all consequential damages due to either party's 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.

§ 15.2 Miscellaneous – Claims

§ 15.2.1 In the event of a dispute giving rise to a Claim, the party making the Claim may request that representatives of the parties meet within fifteen (15) days of receipt of Notice of a Claim in an effort to reach a resolution. If unable to do resolve the Claim at the meeting or if no meeting takes place, the Claim shall be subject to the dispute resolution provisions herein.

§ 15.2.2 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.

§ 15.2.3 In evaluating Claims, the Owner may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Owner in rendering a decision.

§ 15.2.4 If the Owner requests a Contractor 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 Owner when the response or supporting data will be furnished, or (3) advise the Owner that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Owner will either reject or approve the Claim in whole or in part.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7,shall be subject to mediation as a condition precedent

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to binding dispute resolution, and after exhaustion of the informal dispute resolution process set forth in Section 15.2.1.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.3.4 Mediation may include, by consolidation on joinder or in any other manner, persons or entities other than the Owner and Contractor who are substantially involved in a common question of fact or law and whose presence is required if complete relief is to be accorded in mediation. The Contractor specifically consents to the inclusion of such other persons or entities in mediation. The Contractor furthermore waives all objections (and consents) to joinder of the Contractor as a party to any mediation related to the Project in which the Owner is joined or is otherwise positioned as a party and in which the Contractor's conduct or its performance is in any way relevant to the subject of a dispute. The Contractor agrees to participate in good faith in any mediation proceeding in an effort to resolve the dispute(s) at issue therein. The provisions of this § 15.3.4 shall be specifically enforceable under applicable law in any court having jurisdiction thereof. The Contractor also agrees to include the provisions of this § 15.3.4 in all Subcontracts, Purchase Orders, and other agreements to which it is a party concerning the Project, thereby comparably committing its Subcontractors, suppliers, materialmen, and like entities.

§ 15.4 Litigation

§ 15.4.1 Any and all claims shall be subject to litigation in the Court of Common Pleas of Montgomery County, Pennsylvania which shall have exclusive jurisdiction and venue.

ARTICLE 16 ADDITIONAL PROVISIONS

§ 16.1 Project Site Requirements

§ 16.1.1 Temporary Ventilation. The Contractor shall provide temporary ventilation to remove from the structure any excessive heat and/or humidity in enclosed portions of the Work resulting from its construction operations so that the Work may be carried on without interruption and under correct conditions, including required dryness for installation of the various materials. Removing any dangerous or noxious fumes or particles suspended in the air is the responsibility of the Contractor whose construction operations caused these conditions to exist. Temporary equipment used for this temporary ventilation shall produce no hazard to the Work or to any person in or near it. The Contractor shall furnish all such temporary equipment; pay all costs for it and for its operation, including fuel and power supplies during operation both in and out of normal working hours. The Contractor shall remove the equipment when it is no longer required, or when so directed by the Owner.

§ 16.1.2 Work Beyond Limit of Contract. For purposes of performing the Work, the site is defined by the Limit of Contract lines shown on the drawings. The Contractor is responsible for any work performed beyond the limit of Contract.

§ 16.1.3 Advertising. No advertising is permitted within the Work area or adjacent area. This does not apply to corporate vehicles or attire.

§ 16.1.4 Storage and Stockpiling on Roofs. No materials of any type may be stored or stockpiled overnight on roofs.

§ 16.1.5 Temporary Traffic Control. The Project site may have active pedestrian, bike or automobile traffic adjacent to site for the entire duration of the Project. If applicable, the Contractors shall, incorporate, furnish and implement the following work as part of this Project:

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Traffic Control – Temporary Traffic Control Guidelines (Penndot Publication 213): Publication 213 applies to Contractors; utilities; Federal, State, County, township and municipal governments; and others performing applicable construction, maintenance, emergency or utility/permit work 9on highways or so closely adjacent to a highway that workers, equipment or materials encroach on the highway or interfere with the normal movement of traffic. The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130 and Temporary Traffic Control Guidelines (PennDOT Publication 213) through a Temporary Traffic Control (TTC) zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

§ 16.1.6 Noise Reduction. The Contractor must take reasonable steps to minimize noise and shall perform work in accordance with local noise ordinances. The Contractor shall perform noise-producing work in less sensitive hours of the day or week as directed by the Owner. The Contractor shall maintain noise-producing work at or below the decibel levels and within the time periods specified and shall perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m. unless otherwise permitted by the Owner and permissible by local ordinance.

§ 16.1.7 Visible Dust Emissions. No person shall perform any construction, demolition, excavation, extraction, or other earthmoving activities unless appropriate measures are sufficiently implemented to limit Visible Dust Emissions (VDE) to 20% opacity and comply with the conditions for a stabilized surface area when applicable. The Contractor shall apply sufficient water to building exterior surfaces, and/or unpaved surface areas where equipment will operate to limit VDE to 20% opacity throughout the duration of razing and demolition activities or handling, storage, and transport of bulk materials on-site or off- site. The Contractor shall apply sufficient dust suppressants to unpaved surface areas within 100 feet where materials from razing or demolition activities will fall in order to limit VDE to 20% opacity. The Contractor shall also apply sufficient dust suppressants to unpaved surface areas where wrecking or hauling equipment will be operated in order to limit VDE to 20% opacity.

§ 16.1.8 Tobacco Use on Project Site. Use of tobacco products (smoke and smokeless, including vapor) shall be restricted on site after the building has been enclosed (with permanent or temporary enclosures). Personnel found in noncompliance with this directive may be removed from the site upon discovery of this noncompliance.

§ 16.2 Federal and A.S.T.M. and Other Specifications. Reference to Federal, A.S.T.M. and other standard specifications references and designations means those in effect at the date of bid. Basic codes and regulations incorporated by reference, standard regulations and codes refer to editions in effect at the date of proposals, including current addenda or errata. The most stringent section of each code applies.

§ 16.3 Prevailing Minimum Wage Predetermination. The Contractor is hereby notified that this Contract is subject to the provisions, duties, obligations, remedies and penalties of the Pennsylvania Prevailing Wage Act, 43 P.S. §165-1 et seq., as amended, which is incorporated herein by reference as if fully set forth herein. In compliance with said Pennsylvania Prevailing Wage Act, the Prevailing Minimum Wage Predetermination is hereto attached and made part hereof as approved by the Secretary of Labor and Industry. If a job classification is not covered by the Prevailing Wage Predetermination, the Contractor may not pay individuals in that classification less than the lowest rate for laborers, as set out in the predetermination.

§ 16.4 Tax Liability and Offset

§ 16.4.1 The Contractor, by execution of this Agreement, certifies that it has no outstanding tax liability to the Commonwealth of Pennsylvania or the Owner; authorizes the Department of Revenue to release information related to its tax liability to the Owner; and authorizes the Owner to set off any State and local tax liabilities of the Contractor or any of its subsidiaries, as well as any other amount(s) due to the Owner from the Contractor that are not being contested on appeal by the Contractor, against any payment due to the Contractor under an agreement with the Owner.

§ 16.4.2 The foregoing certification of no outstanding tax liability is a material representation of fact upon which reliance is placed by the Owner in entering this Agreement. If it is later determined that the Contractor knowingly rendered an erroneous or inaccurate certification, the Owner may find the Contractor in default and terminate this Agreement. Such erroneous or inaccurate certification may also be grounds for initiation of civil or criminal proceedings.

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§ 16.5 Debarment or Suspension
The Owner shall recommend debarment or suspension action against the Contractor whenever there is substantial evidence that there exists a cause for debarment or suspension.

§ 16.6 Contractor's Responsibility
§ 16.6.1 The Contractor certifies, in writing, for itself, its Subcontractors and consultants required to be disclosed or approved by the Owner, that as of the date of its execution of this Agreement, that neither the Contractor, nor any such subcontractors or consultants, are under suspension or debarment by the Commonwealth of Pennsylvania, Owner or any other governmental entity, instrumentality, or authority and, if the Contractor cannot so certify, then it agrees to submit a written explanation of why such certification cannot be made.

§ 16.6.2 The Contractor also certifies, in writing, that as of the date of its execution of this Agreement it has no tax liabilities or other County of Montgomery, PA obligations, or has filed a timely administrative or judicial appeal if such liabilities or obligations exist, or is subject to a duly approved deferred payment plan if such liabilities exist. If the Contractor cannot so certify because of the scope and nature of its organizational structure, then it agrees to make such certification to the best extent possible and to submit, along with its Bid/Contract, a written explanation of why such certification cannot be made in full.

§ 16.6.3 The Contractor's obligations pursuant to these provisions are continuing from and after the effective date of this Agreement through the termination date thereof. Accordingly, the Contractor shall have an obligation to inform the Owner if, at any time during the term of this Agreement, it becomes delinquent in the payment of taxes, or other County of Montgomery, PA obligations, or if it or any of its subcontractors or consultants are suspended or debarred by the Commonwealth of Pennsylvania, Owner, the federal government, or any other state or governmental entity. Such notification shall be made within 15 days of the date of suspension or debarment. To the extent the size or nature of the Contractor prevents it from carrying out this obligation in full, it shall provide written documentation explaining why this obligation cannot be fully complied with and shall have a continuing obligation to report to the greatest extent possible.

§ 16.6.4 The failure of the Contractor to notify the Owner of its suspension or debarment by the Commonwealth of Pennsylvania, Owner, any other state, any other county or the federal government shall constitute an event of default of this Agreement.

§ 16.6.5 The Contractor agrees to reimburse the Owner for the reasonable costs of investigation incurred by any investigative office of the Owner for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Owner that results in the suspension or debarment of the Contractor. Such costs shall include, but shall not be limited to, salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The Contractor shall not be responsible for investigative costs for investigations that do not result in the Contractor's suspension or debarment.

§ 16.7 Covenant Against Contingent Fees. The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage, brokerage or contingent fee (excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business). For breach or violation of this warranty, the Owner shall have the right to annul this Agreement without liability or, in its discretion, to deduct from the Contractor's compensation hereunder, or otherwise recover, the full amount of such commission, percentage, or contingent fee.

§ 16.8 Americans with Disabilities Act. Pursuant to federal regulations promulgated under the authority of the Americans with Disabilities Act (28 C.F.R. 35.101 et seq.), no individual with a disability shall, on the basis of the disability, be excluded from participation in this Agreement or from activities provided for under this Agreement. As a condition of accepting and executing this Agreement, the Contractor 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 the benefits, services, programs, and activities provided by the Owner through contracts with outside contractors. The Contractor shall be responsible for and agrees to indemnify and hold harmless the Owner from all losses, damages, expenses, claims, demands, suits, and actions brought by any party against the Owner as a result of the Contractor's failure to comply with the provisions of this section.

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§ 16.9 Recycled Materials

§ 16.9.1 In accordance with Section 108, Recycled Materials, of the Commonwealth Procurement Code (62 P.S. Section 108), all insulation products incorporated into the Project shall contain the following minimum percentages, by weight, of postconsumer recovered paper or recovered material:

Cellulose Loose-Fill Spray-On	5 % Postconsumer Recovered Paper
Perlite Composite Board	23% Postconsumer Recovered Paper
Plastic Rigid Foam, Polyisocyanurate/Polyurethane:	
Rigid Foam	9% Recovered Material
Foam In-Place	5% Recovered Material
Glass Rigid Foam	6% Recovered Material
Phenolic Rigid Foam	5% Recovered Material
Rock Wool	50% Recovered Material

§ 16.9.2 "Postconsumer Recovered Paper" is defined as "any paper, paperboard, and fibrous wastes from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards and used cordage; as well as all paper, paperboard, and fibrous wastes that enter and are collected from municipal solid waste."

§ 16.9.3 "Recovered Materials" is defined as "waste material and byproducts which have been recovered or diverted from solid waste, but such term does not include those materials and byproducts generated from, and commonly reused within, an original manufacturing process."

§ 16.9.4 Materials and installations specified for the Project by the Architect shall comply with this requirement.

§ 16.10 Trade Practices Act

§ 16.11.1 The Contractor, in the preparation of the design documents for the Project, shall comply with the requirements of the Trade Practices Act (71 P.S. § 773.101, et seq.). The Act prohibits the Owner from specifying, purchasing, or permitting to be furnished or used, in any public works, aluminum or steel products made in a foreign country which has been determined as "discriminating" by the Commonwealth.

§ 16.10.2 Aluminum or Steel Products means aluminum or steel products rolled, formed, shaped, drawn, extruded, forged cast, fabricated, or otherwise similarly processed, or processed by a combination of two or more of such operations, from aluminum or steel not made in the United States.

§ 16.10.3 The countries of Brazil, South Korea, Spain, and Argentina have been found to discriminate against certain aluminum and steel products made in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed below, is not permitted:

- **.1** **Brazil:** Welded carbon steel pipes and tubes; carbon steel wire rod; tool steel; certain stainless steel bar; stainless steel wire rod and cold-form 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 sheet.
- **.2** **Spain:** Certain stainless steel products, including stainless steel wire rod, hot-rolled stainless steel bars and cold-formed stainless steel bars; pre-formed stainless steel bars; pre-stressed concrete steel wire strand; 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 sheet.
- **.3** **South Korea:** Welded carbon steel pipes and tubes hot-rolled carbon steel place; hot-rolled carbon steel sheet and galvanized steel sheet.
- **.4** **Argentina:** Carbon steel wire rod and cold-rolled carbon steel sheet.

§ 16.11 Steel Products Procurement Act

§ 16.11.1 The Contractor shall comply with the requirements of the Steel Products Procurement Act (73 P.S. 1881, et seq.). The Steel Products Procurement Act requires that any steel products being used or supplied in the performance of the Contract must be "steel products" as defined in the Act. Steel Products are considered to be products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly processed, or processed by a combination of two 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.

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.1 Includes cast iron products.
.2 Includes 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.
.3 Does not include steel products which will not be incorporated into the Project (i.e., tools – hammers/wrenches); scaffolding used to construct the Project and removed after completion; and trailers used as offices by contractors and removed after completion of the Project.
.4 Transportation equipment shall be determined to be a United States steel product only if it complies with Section 165 of Public Law §§ 97-424 (96 Stat. 2136).
.5 Owner vs. Product. Each "product" in the Owner is identified as a separate and distinct steel product.

§ 16.11.2 When the Owner's design specifies trade names, catalog numbers, and manufacturers for materials and equipment, they are provided for the purpose of establishing a standard of quality, performance, and appearance, and for establishing a standard of competitive bidding. The use of such descriptive information will not relieve the Contractor with compliance with all respects of the Act.
Origin of Steel.
.1 If the product contains 100 percent United States manufactured steel, it is a "steel product" under the Act, no matter where the non-steel components of the product are manufactured.
.2 If the product contains 100 percent steel manufactured in a foreign country, its acquisition is prohibited.
.3 If the product contains both foreign and United States manufactured steel (no matter how little or how much of each), the product shall be determined to be a United States steel product if at least 75 percent of the total cost of the articles, materials, and supplies have been mined, produced, or manufactured in the United States.

§ 16.11.3 If 100 percent of the steel product is identifiable (i.e., stamped United States Steel), then the Contractor shall submit certification documentation. If the steel product is unidentified, the Contractor shall provide documentation including, but not limited to: invoices, bills of lading, and mill certification. The Owner is authorized to withholding payments until the documentation or certification has been provided. If payments have been made but should not have been made because of noncompliance, the Owner or the Commonwealth Attorney General may recover the payments directly from the Contractor, subcontractor, or manufacturer who did not comply. Additionally, any person who willfully violates the Act shall be prohibited from submitting bids or performing work for the Commonwealth for five years.

§ 16.11.4 The Steel Products Procurement Act requirement may be waived by the Owner when the Owner determines that steel products are not produced in the United States in sufficient quantities to meet the requirements of the Contract and/or when the product appears on the Department of General Services' annual Final List of Exempt Machinery and Equipment Steel Products.

§ 16.12 Environmental Quality Control

§ 16.12.1 All Prime Contractors and their subcontractors shall perform the Work in a manner that shall minimize the possibility of air, water, land, and noise pollution. Each Prime Contractor shall comply with all statutes and regulations, as amended, concerning environmental quality control administered by the Pennsylvania Department of Environmental Protection, including but not limited to:
.1 Clean Streams Law
.2 Pennsylvania Sewage Facilities Act
.3 Air Pollution Control Act
.4 Surface Mining Conservation and Reclamation Act
.5 Bituminous Coal Open Pit Mining Conservation Act
.6 Dams and Encroachments Act
.7 Water Well Driller's Act
.8 Water Works Act and Atomic Energy Act

§ 16.12.2 The Contractor shall be solely responsible for securing all required permits and for any violations. Storage, collection, transportation, processing, and final disposal of solid waste shall be in accordance with regulations and standards of the Pennsylvania Department of Environmental Protection (DEP). Immediately upon notice of award of the Contract the Contractor shall apply for the necessary permits from DEP. A copy of this permit must be submitted to the Owner before commencing waste disposal.

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§ 16.13 Right to Know Law

§ 16.13.1 Unless otherwise determined by a Pennsylvania appellate court subsequent to the execution of this Agreement, the Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104 ("RTKL"), applies to this Agreement. Unless the Contractor provides the Owner, in writing, with the name and contact information of another person who will act on behalf of the Contractor regarding the RTKL, the Owner shall notify the Contractor if the Owner needs the Contractor's assistance in connection with a request made under the RTKL. The Contractor shall notify the Owner in writing of any change in the name or the contact information within a reasonable time prior to the change.

§ 16.13.2 Upon notification to the Contractor that the Owner has received a request for the Contractor's records under the RTKL (the "Requested Information"), the Contractor agrees to assist the Owner in responding to the request. Such assistance shall include providing the Owner, within three (3) days, with copies of any Requested Information in the Contractor's possession that the Contractor deems a Public Record, as that term is defined in the RTKL, or otherwise notify the Owner that the Requested Information is not a Public Record. If the Contractor is unable to provide the Requested Information within three (3) days for one of the reasons specified in the RTKL, the Contractor agrees to timely notify the Owner that it will need up to an additional twenty-five (25) days, and must provide in writing the reason the additional time is needed. If the Contractor makes a determination the Requested Information is within the scope of the RTKL but fails to provide the Requested Information to the Owner within the period specified in this provision, the failure shall be considered an event of default and the Contractor shall pay, indemnify, and hold the Owner harmless for any damages, penalties, detriment, or harm that the Owner may incur as a result of the Contractor's failure.

§ 16.13.3 The Contractor's determination as to whether the Requested Information is a Public Record is dispositive of the question as between the parties. The Contractor agrees to provide information and/or to appear before the Office of Open Records or Pennsylvania Courts in support of the Owner's denial of access to a record the Contractor determined was not a Public Record. The Contractor agrees to indemnify the Owner for any court costs, attorneys' fees, or civil penalties awarded against the Owner under the RTKL in connection with or as a result of the Contractor's denial of access to Requested Information.

§ 16.13.4 If in the course of this Agreement, the Owner is provided with information the Contractor clearly identifies as a Trade Secret or Confidential Proprietary Information, as those terms are defined by the RTKL, the Owner agrees to abide by the terms of Section 707 of the RTKL and timely provide the Contractor with notice of a request for this information and allow the Contractor the ability to respond, as provided by the RTKL. The Contractor reserves all rights and remedies as allowed by law relating to the Owner's unauthorized disclosure of the Contractor's Trade Secret or Confidential Proprietary Information. This provision shall not be construed to limit the sovereign immunity of the Owner.

§ 16.13.5 The Owner will reimburse the Contractor for any costs associated with complying with this provision only to the extent allowed under the applicable fee schedule established by the Office of Open Records or as otherwise provided by the RTKL if the fee schedule is inapplicable.

§ 16.13.6 The Contractor agrees to abide by any decision to release a record to the public made by the Office of Open Records after timely appeal to the Pennsylvania Courts.

§ 16.14 Labor Harmony/Jurisdictional Disputes

§ 16.14.1 The Contractor shall hire all personnel necessary for the proper and diligent prosecution of the Work in accordance with the Project Schedule. The Contractor shall maintain labor peace and harmony throughout the duration of the Project. In the event of a labor dispute, the Contractor shall not be entitled to any increase nor shall any adjustment be made to the Contract Sum or Contract Time.

§ 16.14.2 In the event of a jurisdictional dispute among or between any labor unions arising out of or relating to Contractor's Work, Contractor shall be solely responsible for promptly resolving the same without involvement by the Owner, Construction Manager or Architect. The Contractor shall be responsible for any delays or impacts arising out of jurisdictions disputes arising out of or relating to Contractor's Work.

§ 17 EQUAL EMPLOYMENT OPPORTUNITY AND NON-DISCRIMINATION

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§ 17.1 Non-Discrimination/Sexual Harassment

During the term of this Contract, Contractor agrees as follows:

§ 17.1.1 Contractor shall not discriminate against any employee, applicant for employment, any independent Contractor or any other person because of race, color, religious creed, ancestry, national origin, service in the uniformed services

As defined in state and federal law), veteran status, age, sex, sexual orientation, marital or family status, pregnancy, pregnancy-related conditions, physical or mental disability, gender, perceived gender, gender identity, genetic information or political ideas, or any other basis prohibited by law.

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, service in the uniformed services (as defined in state and federal law), veteran status, age, sex, sexual orientation, marital or family status, pregnancy, pregnancy-related conditions, physical or mental disability, gender, perceived gender, gender identity, genetic information or political ideas, or any other basis prohibited by law. 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 employees, agents, applicants for employment and other persons, notices to be provided by the contracting agency setting forth the provisions of this non-discrimination clause.

§ 17.1.2 Contractor shall in solicitations or advertisements placed by it or on its behalf state all qualified applicants will receive consideration for employment without regard to race, color, religious creed, ancestry, national origin, age, or sex.

§ 17.1.3 Contractor shall send each labor union or workers' 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 and shall post copies of the notice in conspicuous places available to employees and applicants for employment. Similar notices shall be sent to every other source of recruitment utilized by Contractor.

§ 17.1.4 It shall be no defense to a finding of a non-compliance with Executive Order 1972-1 or any regulations issued by the Pennsylvania Human Relations Commission or this non-discrimination clause that recipient had delegated some of its employment practices to any union, training program or other source of recruitment which prevents it from meeting its obligations.

§ 17.1.5 Where the practices of a union or any training program or other source of recruitment will result in the exclusion of minority group persons, so that Contractor will be unable to meet its obligations under Executive Order 1972-1 or any regulations issued by the Pennsylvania Human Relations Commission or this non-discrimination clause, the Contractor shall then employ and fill vacancies through other employment procedures without regard to race, color, religious creed, ancestry, national origin, sex, or age, taking affirmative action to obtain qualified minority group persons.

§ 17.1.6 Contractor shall comply with all rules, regulations and orders issued by the Governor, the Attorney General, and the Human Relations Commission relating to laws, prohibiting discrimination in hiring or employment opportunities. In the event of Contractor's non-compliance with the non-discrimination clause of this Contract or with any such rules, regulations or orders, this Contract may be cancelled, terminated or suspended in whole or in part, and recipient may be declared ineligible for further Commonwealth contracts, and such other sanctions may be imposed and remedies invoked as provided by rule, regulation or order of the Governor, Attorney General, or the Human Relations Commission, or as otherwise provided by law.

§ 17.1.7 Contractor shall furnish all information and reports required by the Governor, Attorney General, and the Human Relations Commission and will permit access to its books, records and accounts by the contracting agency and the Human Relations Commission, for purposes of investigation to ascertain compliance with provisions of Executive Order 1972-1 or any regulations issued by the Pennsylvania Human Relations Commission or this non-discrimination clause.

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§ 17.1.8 Contractor shall actively recruit minority Subcontractors or Subcontractors with substantial minority representation among their employees.

§ 17.1.9 The Contractor and each of its subcontractors or consultants shall establish and maintain a written sexual harassment policy and shall inform their employees of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined.

§ 17.1.9 Contractor shall include the provisions of Paragraphs 17.1.1 through 17.1.90 in every Subcontract or Purchase Order, so that such provisions will be binding upon each Subcontractor or vendor or other person. If the Contractor cannot fully comply with this subsection due to the nature or scope of its organization, it must use best efforts to do so and provide a written explanation as to why it is unable to fully comply.

§17.1.10 The Owner may cancel or terminate this Agreement and all money due or to become due thereunder may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the agency may proceed with debarment or suspension and may place the Contractor in the Contractor Responsibility File.

§ 17.1.10 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 Ch. 49.

DRAFT

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MONTGOMERY COUNTY PUBLIC SAFETY TRAINING CAMPUS
New Live Fire Training Building
Plymouth Township, PA

SPECIAL PROJECT REQUIREMENTS

1. **CONSTRUCTION MANAGEMENT SOFTWARE:**
   Prime Contractors will utilize e-Builder / Unity Construct, the County's construction management software platform, for the duration of the project. Tools and processes to be utilized within e-Builder include, but are not limited to, RFI submissions, product submittals, invoicing / payment applications and schedule updates (via Microsoft Project or Primavera P6).

2. **PERMITS:**
   Prime contractors are responsible for the submission of any applicable permit applications, fees and inspections pertaining to their work. Refer to Plymouth Township's commercial permit requirements.

3. **WORK SITE:**
   All work performed during regular 7:00 A.M. – 3:30 P.M. County business hours (Monday thru Friday). Work may not be performed at other times without 48 hours advanced notice and written approval of the County representative. The work site and surrounding area shall be kept free from accumulation of waste materials and debris during this project. All debris and garbage must be removed from the site by the Contractor in a timely manner.

4. **ALLOWANCE:**
   An allowance for unforeseen conditions is included in the Contract Sum and is controlled by the County. The County shall determine at its sole discretion which, if any, costs it will authorize in writing to be paid from or deducted by this Allowance. The costs (if any) for design, products, delivery, installation, labor, insurance, payroll, taxes, bonding, differing site conditions and equipment rental will be included in any authorization of expenditure of funds from this Allowance. Funds will be drawn from this Allowance only with the County's approval. At Contract Closeout, funds remaining in Allowance will be credited to the County.

5. **PRE-BID CONFERENCE:**
   Prime contractor is strongly encouraged to attend and register at the pre-bid conference on-site. Contractor will verify existing conditions, quantities and dimensions even when County-issued drawings are provided.

6. **SUBSTITUTIONS:**
   All products and manufacturers listed are basis of design products. Provide the product as specified or an approved equal per County product substitution procedures.

7. **CONTRACTOR RESPONSIBILITIES:**
   The Contractor will be responsible for daily construction management during work at the site and coordinating all construction activities in cooperation with the County. The Contractor is required to provide all means for safe access including personal protective equipment (PPE), lifts and operators. The Contractor is not permitted to use County equipment. Services include, but are not limited to:

   a. Prepare and enforce an OSHA-compliant job site safety plan
   b. Maintain a master project schedule
   c. Subcontractor selection / management
   d. Quality Assurance
   e. Progress meetings
   f. Daily reports
   g. Prepare all pay requests / certified payrolls
   h. Prepare all submittals
   i. Prepare all shop drawings, stamped by licensed architect / engineer if required
   j. Coordinate deliveries
   k. Prepare and manage punch list
   l. Assist architect / engineer with preparation of close-out manuals and as-built drawings
   m. Conduct final inspections in conjunction with the County
   n. Ensure timely completion of all work

8. **ALTERNATES:**
   The County shall have the right to accept Alternates in any order or combination and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

Exhibit A

Community Participation Goal

In keeping with Montgomery County's policy to offer assistance to local, small, and disadvantaged businesses, as defined in section 7 of the "Procurement Policy of Montgomery County," the County has adopted a good faith effort goal ("County Participation Goal") for the Montgomery County projects whereby, with respect to the total dollars spent for contracted construction work:

1. Fifteen percent (15%) paid to local businesses AND
2. Five percent (5%) paid to disadvantaged businesses AND
3. Three percent (3%) of total labor hours paid in conjunction with contracted construction work must be paid to individuals residing in zip codes situated no more than five miles from the perimeter of the geographic boundary of the 19401 zip code

Sections 7.b.1-3 of the procurement policy provide the following definitions:

1. "Local" business means a person, partnership, corporation or other business entity authorized to transact business in Montgomery County and having a bona fide establishment for transacting business in this County at which it was transacting business on the date when bids or proposals for the public contract were first solicited.
2. "Disadvantaged" business means a person, partnership, corporation or other business entity in the United States which is owned or controlled by a majority of persons, not limited to members of minority groups, who have been deprived of the opportunity to develop and maintain a competitive position in the economy because of social disadvantages.

All bidders on Montgomery County projects must include as part of their bid submission a commitment to meet this goal, demonstrated by describing how the contractor will proactively seek to accomplish the County's goal. Failure to include a plan to fulfill the stated County goal can render a bid unresponsive. Subcontracting commitments to qualifying businesses made at the time of bid or during contract execution must be maintained throughout the term of the contract. Any proposed change must be submitted to the County for approval.

After award, the successful bidders' commitment to the County Participation Goal will be calculated and credited as follows:

1. Definition and Certification of businesses for the purposes of this project:
    a. Local businesses: defined by having a center of operation headquartered in Montgomery County, as defined by address zip code
    b.
2. For the purposes of this Community Participation Goal, the County will consider only those businesses certified by the below entities to be considered "disadvantaged" in meeting the procurement policy definition. Businesses not certified by one of the listed entities will not be considered to fulfill the definition of disadvantaged business.
    a. ACCEPTABLE CERTIFYING ENTITIES
        1. National
            a. Women's Business Enterprise National Council (WBENC)

b. National Minority Supplier Development Council (NMSDC)

2. Local and Regional
    a. NJ Unified Certification Program - NJ Transit, The Port Authority of NY & NJ, NJDOT
    b. Delaware Department of Transportation (DelDOT)
    c. Eastern Minority Supplier Development Council (MSDC) - affiliate for Pennsylvania, New Jersey, Delaware
    d. Pennsylvania Unified Certification Program (PENNDOT, SEPTA, Allegheny County, PHL PNE, Port Authority)
    e. City of Philadelphia
    f. The Enterprise Center
    g. New Jersey Department of the Treasury
    h. State of Delaware, Office of Supplier Diversity
    i. Women's Business Enterprise Center (WBEC-East)

b. REQUIRED CERTIFICATION TO FULFILL DEFINITION OF DISADVANTAGED BUSINESS
    1. A Disadvantaged Business is defined as a Minority Business Enterprises, Women Business Enterprises, LGBT Business Enterprises, Disability-Owned Business Enterprises, and Service-Disabled Veteran Business Enterprises that have a valid and current certification from one or more of the agencies listed above. Proof of certification must be provided.

3. Good Faith Effort: While the County has established the percentage goals listed above based on the achievability of these thresholds, Contractors must demonstrate "good-faith efforts" to comply with community program participation goals throughout the project.
    a. Contractors must take all necessary and reasonable steps to achieve the community participation goals
    b. Contractors must document its good-faith efforts. This includes documenting all efforts to:
        i. Solicit certified firms for the project;
        ii. Negotiate in good faith with all contractors who express an interest in the project; and
        iii. Assist contractors in obtaining bonding, lines of credit, insurance, equipment, supplies or materials as required by the project owner.
    c. Prompt and accurate disclosure
        i. Contractors should disclose changes or developments in its arrangements with local or disadvantaged firms to the owner
        ii. Relevant disclosures may be made either in a formal manner (e.g., by submitting official, required forms that document utilization) or in an informal manner (e.g., by making telephone calls to project owner personnel), as appropriate for the particular situation.

4. Calculation and credit method: contractor participation level will be tracked against the County Participation Goal separately for the three categories utilizing the

following calculations and dividing that total amount by the total contract award price.

a. Local or Disadvantaged contractors / subcontractors as defined in County procurement policy and verified as described, performing at least sixty percent (60%) of the subcontract with their own employees will be credited toward the County Participation Goal at 100 percent (100%) total dollar value of the subcontract / supply contract
b. For crediting of labor hours (workforce):
    i. Hours worked by individual workers residing in zip codes within Montgomery County will be credited based on submitted payroll reports submitted in keeping with contract requirements, as follows:
        1. One hundred percent (100%) of hours worked by individual workers residing zip codes within five miles of the geographic border of 19401.
c. Local or Disadvantaged stocking suppliers are credited at sixty percent (60%) of the total cost of the materials or supplies purchased. A stocking supplier is a regular dealer that owns, operates, or maintains a store, warehouse, or other establishment, in which the materials, supplies, articles, or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.
d. Local or Disadvantaged nonstocking suppliers are credited at only the amount of the fee or commission charged by the Local or Disadvantaged nonstocking supplier for assistance in the procurement of the materials and supplies provided the fees or commissions are reasonable and not excessive as compared with fees customarily allowed for similar services and with the understanding that under no circumstances shall the credit, for a Local or Disadvantaged nonstocking supplier, exceed 10% for the purchase order cost. A nonstocking supplier does not carry inventory but orders materials from a manufacturer, manufacturer's representative, or a stocking supplier. In order for a nonstocking supplier to receive credit, it must perform a useful business function by engaging in meaningful work (i.e. negotiating price; AND determining quality and quantity; AND ordering materials; AND paying for the materials) and the fee or commission must be provided with the purchase order and the Local or Disadvantaged utilization report. Industry practices and other relevant factors will be considered.
e. Local or Disadvantaged manufacturers are credited at 100 percent (100%) of the total cost of the materials or supplies purchased.
f. Local or Disadvantaged business participation shall include all tiers of design and / or construction.
    i. The dollar value of any commitment to a Local or Disadvantaged business cannot be double counted. In the event that the Local or Disadvantaged business whose entire subcontract value is counted towards the County Participation Goal then subcontracts a portion of the work or supplies associated with this subcontract to another Local, or Disadvantaged business, the dollar value of the subcontract with/to this lower tier Local, or Disadvantaged business is NOT counted in the

Contractor's Participation Level in order to prevent the duplicate counting of Local or Disadvantaged business commitment dollars. In this case, the dollar value of this subsequent Local or Disadvantaged business subcontract has already been included within the scope of work and dollar value of the Local or Disadvantaged business commitment already counted as a part of the Contractor's Participation Level.

5. Successful bidders will be required to submit the following documentation on a monthly basis with payment applications to enable County monitoring of the County Participation goals:
    a. Local or Disadvantaged business utilization report (to be provided by County), electronically submitted monthly, which will be used to assess whether the Contractor is on track to meet or exceed the County Participation Goal by Close-Out inspection, as required. Forms will be submitted to the Construction Manager and uploaded to a web-based tracking software. Access will be provided to each prime contractor.
        i. Failure to submit a Local, Small, or Disadvantaged business Utilization Report with each Application for Payment will result in an incomplete Application for Payment and it being returned to the Contractor. An incomplete Application for Payment will not be processed.
    b. The Contractor may also be asked to submit documentation evidencing their good faith effort in pursuit of the County Participation Goal and so should maintain documentation of their efforts throughout the project. At a minimum, such documentation includes the following ("Good Faith Effort documentation"):
        i. Employees involved in the pre-bid phase of a project must exercise good faith efforts to:
            1. Ensure that as many qualified local and disadvantaged firms as possible are aware of the project and the specific types of work for which contractor may use subcontractors; and
            2. Provide local and disadvantaged firms with every reasonable opportunity to bid for such work.
        ii. To achieve the community participation goals and to document a good faith effort, the following practices should be followed and documented:
            1. Initial Solicitations of local or disadvantaged firms
                a. Solicit local or disadvantaged firms through all reasonable and available means, including, but not limited to:
                b. Obtaining lists of certified local or disadvantaged firms maintained by the certifying agency and contacting local or disadvantaged firms by phone, email, fax or letter or in person to request quotes;
                c. Attendance at local or disadvantaged firm outreach fairs;
                d. Consultation with minority, women's and general contractor groups, community organizations and other

officials or organizations that could be expected to have information regarding the availability of local or disadvantaged firms; and

e. Print and online advertising – including, but not limited to, making sure local or disadvantaged firms are included on recipient mailing lists for potential subcontractors.

2. Ongoing Solicitation Efforts
    a. The solicitation efforts described above should continue through the life of the project, particularly in situations where:
        i. local or disadvantaged firms who were awarded subcontracts choose not to perform, or cannot perform, such work, leading to a shortfall from the project's local or disadvantaged firms utilization goals; or
        ii. New local or disadvantaged firms subcontracting opportunities become available due to change orders or other project developments.
3. Thorough Record-Keeping
    a. All reasonable efforts should be taken to document solicitations of local or disadvantaged firms, in as much detail as is practical to record.
    b. Contractors should maintain written records of:
        i. All solicitations sent by the contractor to potential local or disadvantaged firms.
        ii. All names, email addresses and telephone numbers of local or disadvantaged firms that were considered as potential subcontractors.
        iii. All communications to or from local or disadvantaged firms, including all bids or sub-bids received from local or disadvantaged firms:
            1. Letters, faxes, email and any other form of written correspondence should be preserved.
            2. Telephone calls should be logged
            3. Documentation showing why any local or disadvantaged firm bid was not accepted.
            4. Other and all relevant solicitation records and correspondence with local or disadvantaged firms.

END

Appendix A

SUBMISSION FORMS

The following forms must be submitted and uploaded with the proposal. Failure to include these forms may lead to rejection of the proposal as non-responsive. Each form must be signed by a person authorized to bind the company. Electronic signatures are acceptable.

PUBLIC DISCLOSURE STATEMENT

Provide a YES or NO answer to the following three (3) questions. If you responded "yes" to any question, please explain (responding "yes" does not necessarily disqualify you from doing business with the County).

In the past five (5) years,

1. Has your firm referred any business (whether or not compensated) or otherwise had any financial dealings with any County elected official or County officer?

   No

2. Have any officers or principals of your firm engaged in any dealings of a financial or personal nature with any County elected official or County officer?

   No

3. Have any officers or principals of your firm been solicited for a campaign contribution by or on behalf of any County elected official or County officer?

   No

☑ Confirm that you will comply in all respects with the Pennsylvania Public Official and Employees Ethics Act. 65 Pa.C.S.. § 1101 et seq.

Signature & Date

Typed/Printed Name

Title

CERTIFICATION AND REPRESENTATIONS OF OFFERORS

1. Certification of Eligibility

a. The bidder certifies that neither the offeror, nor any person or firm which has an interest in the proposal or the offeror's firm:

(1) Has been suspended, debarred or otherwise restricted by the County or any Department or Agency of the Federal Government or of any State Government from doing business with such County, Department, Agency or State for the period beginning 5 years prior to the date of this certification;

(2) Has experienced default or noncompliance under any contract with any governmental agency with which it has contracts for the period beginning 10 years prior to the date of this certification; or

(3) Has unresolved findings raised as a result of federal, state or local government audits, or any other governmental investigations concerning the offeror or any person or firm which has an interest in the offeror's firm under any of the offeror's contracts;

(4) Has defaulted on an obligation covered by a bond, and has not been the subject of a claim under any fidelity bond.

(5) Has been found by the Commonwealth of Pennsylvania to be in noncompliance with any applicable civil rights laws.

(6) Is a County Commissioner, County employee, or otherwise prohibited or limited by law from contracting with the County.

(7) Has been convicted of a felony and is not presently the subject of a complaint or indictment charging a felony. (A felony is any offense punishable by imprisonment for more than one year, but does not include any offense classified as a misdemeanor under the laws of a State and punishable by imprisonment of two years or less.)

(8) Has been convicted or found liable for any act prohibited by state or federal law involving conspiracy or collusion with respect to proposing or bidding on any public contract within the last three years. If offeror has been convicted of any act prohibited by State or Federal law involving collusion with respect to proposing or bidding on any public contract within the past three years, offeror should attach an explanation of the circumstances surrounding that conviction.

b. Statements above to which the offeror cannot certify (if any) have been deleted by striking through the words with a pen. The offeror has initialed each deletion (if any) and has attached a true and accurate signed statement (if applicable) to explain the facts and circumstances which qualify the offeror as a responsible offeror for participation in this project.

c. The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the

offeror knowingly rendered an erroneous certification, the contract may be terminated for default.

2. Contingent Fee Representation and Agreement

a. The bidder/offeror represents and certifies as part of its bid/offer that, except for full-time bona fide employees working solely for the bidder/offeror, the bidder/offeror:

(1) ◯ has, ◯ has not employed or retained any person or company to solicit or obtain this contract; and

(2) ◯ has, ◯ has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

b. If the answer to either (a) (1) or (a) (2) above is affirmative, the bidder/offeror shall make an immediate and full written disclosure to the Chief Procurement Officer.

c. Any misrepresentation by the bidder/offeror shall give the County the right to (1) terminate the resultant contract; (2) at its discretion, to deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certificate of Independent Price Determination

a. The bidder/offeror certifies that:

(1) The prices in this bid/offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder/offeror or competitor relating to (i) those prices, (ii) the intention to submit a bid/offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid/offer have not been and will not be knowingly disclosed by the bidder/offeror, directly or indirectly, to any other bidder/offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law;

(3) No attempt has been made or will be made by the bidder/offeror to induce any other concern to submit or not to submit a bid/offer for the purpose of restricting competition; and

b. Each signature on the bid/offer is considered to be a certification by the signatory that the signatory:

(1) Is the person in the bidder/offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(l) through (a)(3) above.

_____ [insert full name of person(s) in the bidder/offeror's organization responsible for determining

the prices offered in this bid or proposal, and the title of his or her position in the bidder/offeror's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(I) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(I) through (a)(3) above.

c. If the bidder/offeror deletes or modifies subparagraph (a)2 above, the bidder/offeror must furnish with its bid/offer a signed statement setting forth in detail the circumstances of the disclosure.

4. Organizational Conflicts of Interest Certification

a. The Contractor warrants that to the best of its knowledge and belief and except as otherwise disclosed, it does not have any organizational conflict of interest which is defined as a situation in which the nature of work under a proposed contract and a prospective contractor's organizational, financial, contractual or other interest are such that:

(1) Award of the contract may result in an unfair competitive advantage;

(2) The Contractor's objectivity in performing the contract work may be impaired; or

(3) That the Contractor has disclosed all relevant information and requested the County to make a determination with respect to this Contract.

b. The Contractor agrees that if after award he or she discovers an organizational conflict of interest with respect to this contract, he or she shall make an immediate and full disclosure in writing to the County which shall include a description of the action which the Contractor has taken or intends to eliminate or neutralize the conflict. The County may, however, terminate the Contract for the convenience of the County if it would be in the best interest of the County.

c. In the event the Contractor was aware of an organizational conflict of interest before the award of this Contract and intentionally did not disclose the conflict to the County, the County may terminate the Contract for default.

d. The Contractor shall require a disclosure or representation from subcontractors and consultants who may be in a position to influence the advice or assistance rendered to the County and shall include any necessary provisions to eliminate or neutralize conflicts of interest in consultant agreements or subcontracts involving performance or work under this Contract.

☑ In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Authorized Negotiators

The offeror represents that the following persons are authorized to negotiate on its behalf with the County in connection with this request for proposals:
(list names, titles, and telephone numbers of the authorized negotiators):

_____

_____

_____

6. Conflict of Interest

In the absence of any actual or apparent conflict, the offeror, by submission of a proposal, hereby warrants that to the best of its knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement, as described in the clause in this solicitation titled “Organizational Conflict of Interest.”
Offeror’s Signature

The offeror hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

Signature & Date

Typed/Printed Name

Title

LOCAL, SMALL, AND DIVERSE BUSINESS CONCERN CERTIFICATION

The Provider represents and certifies as part of its proposal that it:

◯ is, or ◯ is not a local business concern. A "Local business concern" as used in this provision, means a person, partnership, corporation or other business entity authorized to transact business in this County and having a bona fide establishment for transacting business in this County at which it was transacting business on the date when bids or proposals for the public contract were first solicited.

◯ is, or ◯ is not a small business concern. "Small business concern," as used in this provision, means a person, partnership, corporation or other business entity in the United States which is independently owned and which is not dominant in its field of operation or an affiliate or subsidiary of a business dominant in its field of operation.

◯ is, or ◯ is not a diverse business concern. "Diverse business concern" as used in this provision, means a person, partnership, corporation or other business entity in the United States which is owned or controlled by a majority of persons who are women, minorities, persons with disabilities, veterans, military-service-disabled veterans or LGBTQ+ (Note: Minority-owned businesses include but are not limited to Black/African American, Indigenous/Native American, Asian American or Hispanic/Latino-owned businesses).

The diverse vendor must be certified by a recognized third-party certifying organization.

If you are a qualified diverse vendor, you must (a) identify which minority group(s) apply, and (b) provide the Certifying Agency & Certification Number

(a) Specified Minority Group(s): _____

(b) Certifying Agency & Certification #:_____

_____
Signature & Date

_____
Typed/Printed Name

_____
Title

SECTION 000011 NON-DISCRIMINATION AFFIDAVIT

_____, 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 insure 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, and 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 Regulations Commission or this non-discrimination clause that CONTRACTOR had delegated some of its employment practices to any union, training program, or other source of recruitment that 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 practices 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 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 non-compliance 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 provision of the Contract Compliance Regulations, pursuant to 49.35 of this title (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 subcontractors or subcontractors with substantial minority representation among their employees.

9. CONTRACTOR shall include the provisions of this nondiscrimination 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.

By:_____

Witness:_____

CONTRACTOR:_____

Date:_____

SECTION 00008 NON-COLLUSION AFFIDAVIT OF CONTRACTOR

Commonwealth of Pennsylvania :
:
County of _____ :

I am _____ (Name), _____ (Title) of _____ (Name of Company) and I am authorized to make this Affidavit on behalf of my Company, and its Owners, Directors, and Officers. I am the person responsible in my Company for the price(s) and the amount of this Bid.

I hereby state and on behalf of my Company represent and warrant that:

1. The price(s) and amount 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 of the Bid, and neither the approximate prices(s) nor approximate amount 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 the 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 Company is made in good faith and not pursuant to any agreement or discussions with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid.

5. _____ (Company), it affiliates, subsidiaries, officers, directors and employees are not currently under investigation by any governmental agency and have not in the last four years been convicted or found liable of any act prohibited by State or Federal Law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contact.

I state that _____ (Company) fully understands and acknowledges that the above representations are material and important and will be relied upon by the County of Montgomery. I and my Company agree that any misstatement in this affidavit is and shall be treated as fraudulent concealment relating to the submission of bids.

_____ */s/*

_____ Title

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

By:_____ _____
Notary Public My Commission Expires:

Montgomery County New Live Fire Training Building
Public Safety Training Center, Plymouth Township
1175 Conshohocken Road Conshohocken Pennsylvania 19428

General Contractor - Contract Package: GC-01

Bidder Company Name: _____
Bidder Company Address: _____
_____
_____

Contact Name: _____
Contact Phone Number: _____
Contact Email Address: _____

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

A. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with the 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.
B. BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within the timeframe stipulated within the procurement documents .
C. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
    1. BIDDER has examined copies of all Contract Documents, Advertisement to Bid, Instruction to Bidders and other issued procurement documents. Additionally, the Bidder hereby acknowledges receipt of the following addenda by their initials:
        a. Addendum/Addenda _____ (list all addendum numbers) has/have been received, reviewed and incorporated within the BID. _____ (initials).
    2. 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 (changes in Contract Sum or Contract Time) of any kind.
    3. 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.
    4. 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.
    5. 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.

6. BIDDER understands that the OWNER reserves the right to consider Alternate 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 manufacturer's recommendations.

PRICE PROPOSAL

A. The Bidder agrees to perform the various items of Work for the following Lump Sum Price(s):
   1. Base Bid Proposal:
      a. Base Bid Price for all work indicated on the Contract Documents.
      b. Base Bid INCLUDES all Base Bid Allowances (Owner Contingency Allowances) for all Work indicated on the Contract Documents.
      c. Base Bid Price EXCLUDES all individual Unit Prices itemized later in this Bid Form.

B. **BASE BID:**

	BASE BID LINE ITEM SUB-TOTALS	
	Line Item Scope of Work	**Line Item Scope of Work Bid Subtotal**
BB1	Thermal Lining System (Scope of work of Specification Section 07 7000 - Thermal Lining System)	Words: _____Dollars Figures: ($_____)
BB2	Structural Fire Training Systems and Equipment (Scope of Work of Specification Section 11 6733 - Structural Fire Trainer Systems and Equipment and 40 9119 - Temperature Monitoring Equipment)	Words: _____Dollars Figures: ($_____)
BB3	Owner Contingency Allowances Subtotal (GC-01.1 + GC-01.2)	Words: Three Hundred Thousand Dollars Figures: ($300,000.00)
BB4	Subtotal of remainder of Base Bid Work of the GC-01 contract package.	Words: _____Dollars Figures: ($_____)

TOTAL BASE BID (**BB1** + **BB2** + **BB3** + **BB4**)
Words: _____Dollars
Figures: ($_____)

C. **Owner Contingency Allowances**

1. The Contractor must provide a change in scope of work (no change in Contract Sum or Contract Time) Change Order for the allowance work, indicating the allowance amount to be utilized, in which the Construction Manager (CMa) must review with the Owner and approve prior to the Contractor performing the Work. Should the allowance amount be exceeded and the Work approved to be performed, the Contractor will provide a Change Order for the additional Work and only be paid by an approved Change Order for the additional related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused allowance amount by a Change Order credit. All OH&P for allowances MUST be included within the Base Bid of the Project. NO additional OH&P will be allowed in allowances. Change Orders for the utilization of allowances shall not include OH&P. Change Orders for additional Work exceeding allowance amounts shall include OH&P. Change Orders for credit of unused allowance amounts shall be provided with OH&P in addition to the remaining allowance amount.

ALLOWANCE NO.	**ALLOWANCE AMOUNT**
BASE BID ALLOWANCES (Allowances to be included in base bid as indicated)	
Allowance No. GC-01 . 1 - Contingency Allowance	$200,000.00
Allowance No. GC-01 . 2 - Waterline Work Allowance	$100,000.00
ALTERNATE BID ALLOWANCES (Allowances to be included in alternate indicated)	
Allowance No. GC-01 . 3 - Recovery Pavilion Alternate Allowance	$25,000.00

D. **Unit Prices**

1. 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 Owners 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 form OWNER. Unit Prices shall include costs for furnishings 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.

UNIT PRICE ITEMIZATION SCHEDULE	
Unit Price No.	**Contractor's Unit Price Bid**
General Unit Prices	
Unit Price No. 1 - Placement of Engineered Fill	$_____/CY
Unit Price No. 2 - Placement of Drainage Stone Fill; #2A Stone	$_____/CY
Unit Price No. 3 - Placement of Drainage Stone Fill; #8 AASHTO Stone)	$_____/CY
Unit Price No. 4 - Placement of Drainage Stone Fill; #2B Stone (#57 AASHTO)	$_____/CY
GC-01 Construction Package Unit Prices	
Unit Price No. 5 - Removal and Disposal of Contaminated Soil	$_____/CY
Unit Price No. 6 - Removal of Unsatisfactory Soil	$_____/CY
Unit Price No. 7 - Rock Removal	$_____/CY
Unit Price No. 8 - Removal of Rock, Utility Trench	$_____/CY
Unit Price No. 9 - Site Utility Trenching	$_____/CY
Unit Price No. 10 - Milling and Placement of Asphalt Top Layer for Patching of Existing Asphalt	$_____/SF
Unit Price No. 11 - Full Depth Replacement of Existing Asphalt Paving	$_____/SF
Unit Price No. 12 - Placement of Concrete Sidewalk	$_____/SF
Unit Price No. 13 - Replacement of Existing Concrete Paving	$_____/SF
Unit Price No. 14 - Placement of Concrete Paving	$_____/SF

E. **Alternates:**

1. 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 alternates. Alternate 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, manufacturer's recommendations, building codes, and the project specifications. Do not adjust materials allowance under any alternate bid items. Indicate whether alternate price is an add or deduct when a choice is provided.

Alternate No. 1 Recovery Pavilion (This Price shall include Allowance No. GC-01.3)	(Check which applies) _____ **ADD** to Base Bid _____**Deduct** from Base Bid
	Words: _____Dollars Figures: ($_____)

Alternate No. 2 Building 1 Rooftop Canopy	(Check which applies) _____ **ADD** to Base Bid _____**Deduct** from Base Bid
	Words: _____Dollars Figures: ($_____)

Bid Security

A. Bid Security 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 Alternates that may increase the total Bid (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 and Title of Authorized Person to Sign)

State of Incorporation: _____
Business Address: _____
_____
_____
Telephone Number: _____
Email Address: _____

_____

Attest By

_____

Print Name of Person

Corporate Seal:

END OF BID FORM

Montgomery County New Live Fire Training Building
Public Safety Training Center, Plymouth Township
1175 Conshohocken Road Conshohocken Pennsylvania 19428

Plumbing Contractor - Contract Package: PC-22

Bidder Company Name: _____
Bidder Company Address: _____
_____
_____
Contact Name: _____
Contact Phone Number: _____
Contact Email Address: _____

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

A. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with the 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.
B. BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within the timeframe stipulated within the procurement documents .
C. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
    1. 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:
        a. Addendum/Addenda _____ (list all addendum numbers) has/have been received, reviewed and incorporated within the BID. _____ (initials).
    2. 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 (changes in Contract Sum or Contract Time) of any kind.
    3. 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.
    4. 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.
    5. 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.

6. BIDDER understands that the OWNER reserves the right to consider Alternate 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 manufacturer's recommendations.

PRICE PROPOSAL

A. The Bidder agrees to perform the various items of Work for the following Lump Sum Price(s):
   1. Base Bid Proposal:
      a. Base Bid Price for all work indicated on the Contract Documents.
      b. Base Bid INCLUDES all Allowances (Owner Contingency Allowances, Unit Price Allowances) for all Work indicated on the Contract Documents.
      c. Base Bid Price EXCLUDES all individual Unit Prices itemized later in this Bid Form.

B. **BASE BID:**

BASE BID (Contractors Cost for the Work + Owner Contingency Allowance(s))
Words: _____Dollars
Figures: ($_____)

C. **Owner Contingency Allowances**
   1. The Contractor must provide a change in scope of work (no change in Contract Sum or Contract Time) Change Order for the allowance work, indicating the allowance amount to be utilized, in which the Construction Manager (CMa) must review with the Owner and approve prior to the Contractor performing the Work. Should the allowance amount be exceeded and the Work approved to be performed, the Contractor will provide a Change Order for the additional Work and only be paid by an approved Change Order for the additional related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused allowance amount by a Change Order credit. All OH&P for allowances MUST be included within the Base Bid of the Project. NO additional OH&P will be allowed in allowances. Change Orders for the utilization of allowances shall not include OH&P. Change Orders for additional Work exceeding allowance amounts shall include OH&P. Change Orders for credit of unused allowance amounts shall be provided with OH&P in addition to the remaining allowance amount.

ALLOWANCE NO.	**ALLOWANCE AMOUNT**
BASE BID ALLOWANCES (Allowances to be included in base bid as indicated)	
Allowance No. PC-22 . 1- Contingency Allowance	$25,000.00

D. **Unit Prices**

1. 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 Owners 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 form OWNER. Unit Prices shall include costs for furnishings 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.

UNIT PRICE ITEMIZATION SCHEDULE	
Unit Price No.	**Contractor's Unit Price Bid**
General Unit Prices	
Unit Price No. 1 - Placement of Engineered Fill	$_____/CY
Unit Price No. 2 - Placement of Drainage Stone Fill; #2A Stone	$_____/CY
Unit Price No. 3 - Placement of Drainage Stone Fill; #8 AASHTO Stone)	$_____/CY
Unit Price No. 4 - Placement of Drainage Stone Fill; #2B Stone (#57 AASHTO)	$_____/CY
PC-22 Construction Package Unit Prices	
Unit Price No. 15 - Installation of Site Underground Gas Piping: 2 inch	$_____/LF
Unit Price No. 16 - Installation of Building Underground Gas Piping: 2 inch	$_____/LF
Unit Price No. 17 - Installation of Above Ground Gas Piping: 2 inch	$_____/LF
Unit Price No. 18 - Installation of Above Ground Gas Piping: 3/4 inch	$_____/LF
Unit Price No. 19 - Installation of Above Ground Fire Protection Piping: 1 inch	$_____/LF
Unit Price No. 20 - Installation of Above Ground Fire Protection Piping: 4 inch	$_____/LF
Unit Price No. 21 - Installation of Above Ground Fire Protection Piping: 6 inch	$_____/LF
Unit Price No. 22 - Installation of Fire Protection System Sprinkler Head	$_____/EA
Unit Price No. 23 - Installation of Site Underground Domestic Water Supply System, Cold Water Piping: 1 inch	$_____/LF
Unit Price No. 24 - Installation of Building Underground Domestic Water Supply System, Cold Water Piping: 1 inch	$_____/LF

E. **Alternates:**

1. 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 alternates. Alternate 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, manufacturer's recommendations, building codes, and the project specifications. Do not adjust materials allowance under any alternate bid items. Indicate whether alternate price is an add or deduct when a choice is provided.

Alternate No. 1 Recovery Pavilion	(Check which applies) _____ **ADD** to Base Bid	_____**Deduct** from Base Bid
	Words: _____Dollars Figures: ($_____)	

Bid Security

A. Bid Security 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 Alternates that may increase the total Bid (Add Alternates).

Remainder of Page Intentionally Left Blank

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 and Title of Authorized Person to Sign)

State of Incorporation: _____
Business Address: _____
_____
_____
Telephone Number: _____
Email Address: _____

_____
Attest By

_____
Print Name of Person

Corporate Seal:

END OF BID FORM

Montgomery County New Live Fire Training Building
Public Safety Training Center, Plymouth Township
1175 Conshohocken Road Conshohocken Pennsylvania 19428

Electrical Contractor - Contract Package: EC-26

Bidder Company Name: _____
Bidder Company Address: _____
_____
_____

Contact Name: _____
Contact Phone Number: _____
Contact Email Address: _____

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

A. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with the 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.
B. BIDDER accepts all of the terms and conditions of the Instructions to Bidders, including without limitation, those dealing with disposition of Bid Security. BIDDER will sign the Agreement and submit the Contract Security and other documents required by the Contract Documents within the timeframe stipulated within the procurement documents .
C. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
    1. 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:
        a. Addendum/Addenda _____ (list all addendum numbers) has/have been received, reviewed and incorporated within the BID. _____ (initials).
    2. 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 (changes in Contract Sum or Contract Time) of any kind.
    3. 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.
    4. 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.
    5. 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.

6. BIDDER understands that the OWNER reserves the right to consider Alternate 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 manufacturer's recommendations.

PRICE PROPOSAL

A. The Bidder agrees to perform the various items of Work for the following Lump Sum Price(s):
   1. Base Bid Proposal:
      a. Base Bid Price for all work indicated on the Contract Documents.
      b. Base Bid INCLUDES all Allowances (Owner Contingency Allowances, Unit Price Allowances) for all Work indicated on the Contract Documents.
      c. Base Bid Price EXCLUDES all individual Unit Prices itemized later in this Bid Form.

B. **BASE BID:**

BASE BID (Contractors Cost for the Work + Owner Contingency Allowance(s))
Words: _____Dollars
Figures: ($_____)

C. **Owner Contingency Allowances**
   1. The Contractor must provide a change in scope of work (no change in Contract Sum or Contract Time) Change Order for the allowance work, indicating the allowance amount to be utilized, in which the Construction Manager (CMa) must review with the Owner and approve prior to the Contractor performing the Work. Should the allowance amount be exceeded and the Work approved to be performed, the Contractor will provide a Change Order for the additional Work and only be paid by an approved Change Order for the additional related Work. Similarly, should the allowance used be less than the allowance amount, the Contractor will credit the Owner for the unused allowance amount by a Change Order credit. All OH&P for allowances MUST be included within the Base Bid of the Project. NO additional OH&P will be allowed in allowances. Change Orders for the utilization of allowances shall not include OH&P. Change Orders for additional Work exceeding allowance amounts shall include OH&P. Change Orders for credit of unused allowance amounts shall be provided with OH&P in addition to the remaining allowance amount.

ALLOWANCE NO.	**ALLOWANCE AMOUNT**
BASE BID ALLOWANCES (Allowances to be included in base bid as indicated)	
Allowance No. EC-26 . 1 - Contingency Allowance	$40,00.00

D. **Unit Prices**

1. 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 Owners 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 form OWNER. Unit Prices shall include costs for furnishings 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.

UNIT PRICE ITEMIZATION SCHEDULE	
Unit Price No.	**Contractor's Unit Price Bid**
General Unit Prices	
Unit Price No. 1 - Placement of Engineered Fill	$_____/CY
Unit Price No. 2 - Placement of Drainage Stone Fill; #2A Stone	$_____/CY
Unit Price No. 3 - Placement of Drainage Stone Fill; #8 AASHTO Stone)	$_____/CY
Unit Price No. 4 - Placement of Drainage Stone Fill; #2B Stone (#57 AASHTO)	$_____/CY
EC-26 Construction Package Unit Prices	
Unit Price No. 25 - Installation of Site Underground Electrical System Conduit: 4 inch	$_____/LF
Unit Price No. 26 - Installation of Building Underground Electrical System Conduit: 4 inch	$_____/LF
Unit Price No. 27 - Installation of Site Underground Electrical System Conduit: 2-1/2 inch	$_____/LF
Unit Price No. 28 - Installation of Building Underground Electrical System Conduit: 2-1/2 inch	$_____/LF
Unit Price No. 29 - Installation of Above Ground Electrical System Conduit: 3/4 inch	$_____/LF
Unit Price No. 30 - Installation of Above Ground Electrical System Conduit: 1 inch	$_____/LF
Unit Price No. 31 - Installation of Above Ground Electrical System Conduit: 1-1/2 inch	$_____/LF
Unit Price No. 32 - Installation of GFI Duplex Outlet	$_____/EA

E. **Alternates:**

1. 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 alternates. Alternate 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, manufacturer's recommendations, building codes, and the project specifications. Do not adjust materials allowance under any alternate bid items. Indicate whether alternate price is an add or deduct when a choice is provided.

Alternate No. 1 Recovery Pavilion	(Check which applies) _____ **ADD** to Base Bid _____**Deduct** from Base Bid Words: _____Dollars Figures: ($_____)

Bid Security

A. Bid Security 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 Alternates that may increase the total Bid (Add Alternates).

Remainder of Page Intentionally Left Blank

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 and Title of Authorized Person to Sign)

State of Incorporation: _____
Business Address: _____
_____
_____
Telephone Number: _____
Email Address: _____

_____
Attest By

_____
Print Name of Person

Corporate Seal:

END OF BID FORM

PLYMOUTH TOWNSHIP

RESOLUTION NO. 2026 – 27

BE IT RESOLVED, that Plymouth Township Council ("Township") does hereby approve the Land Development Plan prepared by Benesch for Montgomery County ("Owner/Developer"), dated January 14, 2026, last revised March 6, 2026, consisting of Sheet Nos. 1 through 16 ("Plans"), proposing to develop Montgomery County Tax Parcel No. 49-00-02741-50-4, located at 1175 Conshohocken Road ("Property") to construct a NFPA 1402 compliant live fire training building with additional improvements to include a recovery pavilion, infiltration basin, and additional site lighting pursuant to land development application 26-1, in accordance with said Plans, under and subject to the following conditions:

1. That the Owner/Developer shall execute a Public Improvement Agreement and Memorandum of Public Improvement Agreement as required by the Subdivision and Land Development Ordinance and pay all applicable fees and assessments including, but not limited to, the following:

   A. Impact Fee for Transportation Capital Improvements under Ordinance No. 1426 of 2004, as amended, said Impact Fee in an amount to be determined by Carroll Engineering Corporation at the time of construction of a new structure.

   B. Recreation fee to be paid at the time of construction of the new structure to be determined based upon the number of employees and structure square footage.

   C. Sewer Connection Fee to be paid in accordance with the connection fee and EDU schedule in effect at the time of application for connection and payment.

2. That the Owner/Developer shall prepare revised Plans to comply with the requirements/comments as set forth in the March 27, 2026 report of Carroll Engineering Corporation, the Township Traffic Engineer, attached to this Resolution, to the satisfaction and approval of the said Traffic Engineer.

3. That the Owner/Developer shall prepare revised Plans to comply with the requirements/comments as set forth in the March 30, 2026 report of Carroll Engineering Corporation, the Township Sanitary Sewer Engineer, attached to this Resolution, to the satisfaction and approval of the said Sanitary Sewer Engineer.

4. That the Owner/Developer shall prepare revisions to the Plans to comply with the requirements/comments set forth in the March 16, 2026 report of Woodrow and Associates, the Township Engineer, attached to this Resolution, except to the extent that waivers are granted herein, to the satisfaction and approval of the said Township Engineer.

5. That the Owner/Developer shall prepare revisions to the Plans to comply with the requirements/comments set forth in the February 24, 2026 report of Joel Rowe, Zoning Officer, attached to this Resolution, to the satisfaction and approval of the said Zoning Officer.

6. That the Owner/Developer shall prepare revisions to the Plans to comply with the requirements/comments set forth in the February 9, 2026 report of Woodrow and Associates, the Township landscaping engineer, attached to this Resolution, to the satisfaction and approval of the said Landscape Engineer.

7. That the Owner/Developer shall obtain all required permits and approvals from the sewer authority, a DEP sewage facility planning module waiver, the water company with jurisdiction over the Property; and, a Highway Occupancy Permit from Montgomery County for a new driveway, and for curb and sidewalk, if required.

8. That the Owner/Developer shall prepare revisions to the Plans to comply with the requirements/comments set in the April 1, 2026 report of the Planning Agency and the March 24, 2026 report of the Montgomery County Planning Commission, each attached to this Resolution, to the satisfaction and approval of the aforesaid Township Zoning Officer.

9. That the Owner/Developer shall prepare revisions to the Plans to list all waivers granted and notes required by this Resolution.

10. Prior to the issuance of any permits, all outstanding legal, engineering and administrative fees applicable to this land development must be paid by Owner/Developer.

11. This approval is subject to the fulfillment of all the foregoing conditions, in their entirety, and no permit shall be issued, nor shall any development take place on the Property, unless and until all such conditions are fulfilled.

FURTHER RESOLVED, that the Owner/Developer has requested the following waivers from the terms of the Plymouth Township Subdivision and Land Development Ordinance of 1980, as amended, and the Council of Plymouth Township has granted or approved such requests, as indicated:

a. Article V, Section 510.1 – From the requirement that minimum size diameter for storm sewer pipes shall be fifteen (15) inches:

   GRANTED, subject to compliance with Woodrow & Associates' review letter dated March 16, 2026.

b. Article V, Section 518.2.C – From the requirement that plans for proposed plantings shall be prepared by a landscape architect registered by the Commonwealth of Pennsylvania:

GRANTED, subject to compliance with Woodrow & Associates' review letter dated March 16, 2026.

DULY PRESENTED AND ADOPTED, by Plymouth Township Council at a public meeting held on the _____ day of _____, 2026.

PLYMOUTH TOWNSHIP

(Township Seal)

By: _____
LYNNE M. VISCIO, CHAIR

Attest: _____
MATT WEST, MANAGER/SECRETARY

[Signatures on following page]

Montgomery County as Owner/Developer, their successors and assigns, intending to be legally bound hereby, do hereby accept and agree to the conditions set forth herein and as required by Section 903 and to the provisions of Article X, *Fees, Assessments and Costs*, of the Subdivision and Land Development Ordinance.

OWNER/DEVELOPER:

By: _____

Title:

_____

Attest: _____

Responsible Contractor/Subcontractor Certification Cover Sheet

GENERAL INFORMATION

Company Name: _____

Address: _____

City: _____

Telephone Number: _____ Fax Number: _____

Ownership Structure (Please check one):

☐ Sole Proprietorship ☐ Partnership ☐ Corporation ☐ Joint Venture ☐ Other

Description of Services(s) Provided: _____

Contractor's License No.: _____

RESPONSIBLE CONTRACTOR STATUS

Please check one of the following boxes:

1. ☐ Meets all Responsible Contractor requirements (see below)
2. ☐ Meets none of the Responsible Contractor requirements
3. ☐ Meets certain of the Responsible Contractor requirements (provide explanation below)

If you have checked box 3 above, please provide an explanation below (attach additional pages if necessary):

Explanation: _____

_____

_____

RESPONSIBLE CONTRACTOR REQUIREMENTS CHECKLIST

Review the attached checklist and return a completed copy, along with any documents requested therein.

A full list of the Responsible Contractor Requirements can be found on Montgomery County's website (montgomerycountypa.gov) under Administration → County Procurement Policy.

By signing this form, it is understood that contractors have fully reviewed the Responsible Contractor Requirements.

CERTIFICATION OF RESPONSIBLE CONTRACTOR STATUS

On behalf of the above-named company, the undersigned certifies that the information and responses provided herein are true, complete and accurate as of this date, and he/she is aware that any intentionally misrepresented or falsified information may result in disqualification from future contracting opportunities. Further, the above-named company certifies it can provide sufficient written proof that it and all subcontractors comply with the Responsible Contractor Requirements above within five (5) calendar days upon request.

Signature: _____

Name and Title (please print): _____

A copy of this form must be signed and provided to the County before any firm, including sub-contractors if requested, may be considered for award of this contract.

Attachment A – Responsible Contractor/Subcontractor Certification Checklist

Complete the following and provide the documents highlighted in the list below. If you answer "no" to any of the below, please provide a detailed explanation on the cover sheet as to why your firm does not meet the requirement and attach additional pages if necessary.

For all contractors and subcontractors:

Requirement	Response
1. My firm and its employees shall have all valid and effective licenses, registrations, or other credentials required by federal, state, county, or local law. I will provide electronic copies of the relevant credentials.	Y: ____ N: ____
2. My firm meets the bonding requirements for the contract, as well as applicable insurance requirements. I will provide electronic copies of these documents, as well as a hard copy of the bond.	Y: ____ N: ____
3. My firm has not been debarred or suspended by any federal, state, or local government agency or authority within the past three (3) years.	Y: ____ N: ____
4. My firm has not defaulted on any project within the past three (3) years.	Y: ____ N: ____
5. My firm has not had any type of license, registration, or other certification revoked or suspended within the past three (3) years.	Y: ____ N: ____
6. My firm and its principals and owners have not been convicted of any crime relating to their contracting business within the past ten (10) years.	Y: ____ N: ____
7. My firm has not been found in violation of any law applicable to its contracting business within the past three (3) years.	Y: ____ N: ____
8. My firm will employ a sufficient number of craft labor personnel or shall use qualified subcontractors to meet the personnel requirement.	Y: ____ N: ____
9. My firm will pay all craft employees on the project, at a minimum, the applicable wage and fringe benefit rates as established for the classification in which the worker is employed.	Y: ____ N: ____
10. My firm will ensure that all craft labor it employs on the project will have completed, prior to working on the project, the OSHA 10-hour training course for safety. I will provide electronic copies of the relevant training certification documents.	Y: ____ N: ____

11. My firm participates in a bona fide apprenticeship program which is registered with and approved by the U.S. Department of Labor or a state apprenticeship agency and has graduated apprentices to journeyperson status for at least three (3) of the past five (5) years. I will provide (1) a list of all trades or classifications of craft employees my firm will employ on the project and (2) documentation verifying that my firm actively participates in a bona fide apprenticeship program, including the name, state, and registration number of the program.	Y: ____ N: ____
12. My firm shall assign craft labor personnel only to work in the craft or trade in which they are employed.	Y: ____ N: ____
13. My firm has all other technical qualifications and resources, including equipment, personnel, and financial resources, to successfully perform the contract and shall maintain such capabilities throughout the duration of the project.	Y: ____ N: ____
14. My firm shall notify the County within seven (7) days of any material changes in its operation related to any matter attested to in this certification.	Y: ____ N: ____
15. My firm will execute this Contractor Responsibility Certification by a person who has sufficient knowledge to address all matters in this certification.	Y: ____ N: ____
16. If my firm has ever operated under another name, or currently controls or is controlled by another company, or has controlled or was controlled by another company within the past 5 years, whether as a parent company, subsidiary, or other business relation, I will provide a written statement explaining in detail the nature of any such relationship.	Y: ____ N: ____

If my firm is a prime contractor on this project:

Requirement	Response
1. My firm will ensure that at least seventy (70) percent of **all** craft labor workers on the project shall be comprised of either journeyperson workers who have successfully completed a bona fide apprenticeship program or apprentices registered in such programs, and that the apprenticeship participation is in the same trade or craft for which the workers are employed on the project. I will identify on payroll documents whether employees are journeyperson workers, apprentices, or neither.	Y: ____ N: ____
2. My firm will ensure that apprentices are supervised by journeyperson workers in the ratio of one apprentice for the first through fourth journeyperson workers regularly employed; two apprentices for the fifth through ninth journeyperson workers;	Y: ____ N: ____

	and so on with an additional apprentice for each unit of five journeyperson workers regularly employed. My firm will provide copies of its workers apprenticeship credentials showing that an appropriate number of employees are currently registered or have graduated from a bona fide apprenticeship program.	
3.	My firm will ensure that at least one person on the project will have completed, prior to working on the project, an OSHA 30-hour training course. I will provide an electronic copy of the relevant training certification.	Y: ____ N: ____
4.	My firm will make a good-faith effort to employ residents of Montgomery County for at least 40 percent of craft labor hours worked. My firm will provide a statement describing how we will seek to accomplish the community participation goal.	Y: ____ N: ____
5.	My firm will ensure that the appropriate workplace postings, to be identified by the Office of Procurement, are displayed at the project site in a location where notices to employees are customarily posted.	Y: ____ N: ____
6.	My firm agrees that on or around the project start date, we will schedule a kick-off meeting with the County Labor Liaison to discuss the applicable provisions of this Policy.	

If my firm will be subcontracting work to other firms:

	Requirement	Response
1.	My firm will provide a Subcontractor List within seven (7) days of receiving a Notice of Intent to Award Contract which includes the names and business addresses of the subcontractors it intends to use on the project and the scope of the work assigned to each subcontractor.	Y: ____ N: ____
2.	My firm will submit Subcontractor Responsibility Certifications and all supporting information for all entities listed on the Subcontractor List.	Y: ____ N: ____
3.	My firm shall determine whether any firm on its Subcontractor List is organized as a sole proprietorship owned and operated by a single person. For any such entity, my firm will require the subcontractor to supplement its Subcontractor Certification with its Employer Identification Number in addition to the other information required by this certification.	Y: ____ N: ____
4.	My firm agrees that it shall not be permitted to use a subcontractor on any work performed for the County unless it has identified the subcontractor on its Subcontractor List and has provided a Subcontractor Responsibility Certification.	Y: ____ N: ____

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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.)
« »

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.)

[« »] Exhibit A – General Information
[« »] Exhibit B – Financial and Performance Information
[« »] Exhibit C – Project-Specific Information
[« »] 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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.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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« »

.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?

« »

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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)

«Montgomery County»
« »

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

« »« »
« »

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

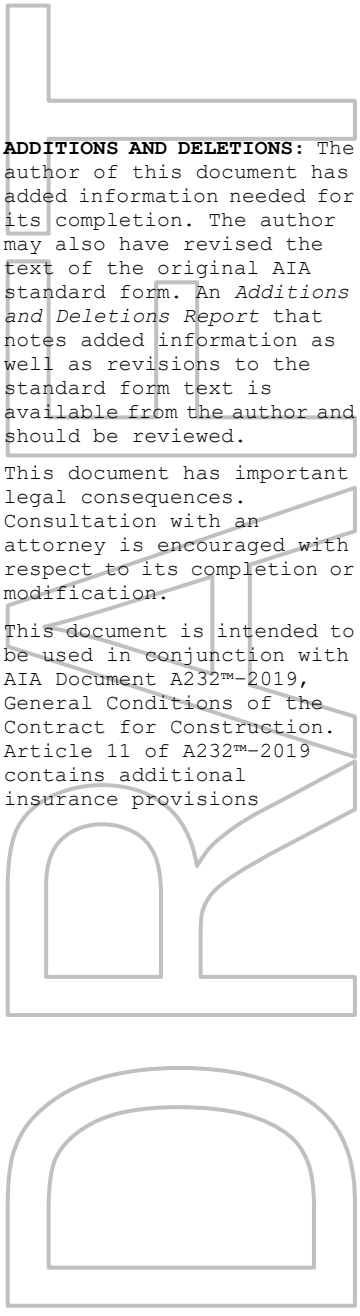
The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

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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.2.3.1 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,

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including costs of investigating a potential or actual breach of confidential or private information.
(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 « » ($ « ») each occurrence, « » ($ « ») general aggregate, and « » ($ « ») 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 « » ($ « ») 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 « » ($ « ») each accident, « » ($ « ») each employee, and « » ($ « ») 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 « » ($ « ») per claim and « » ($ « ») 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 « » ($ « ») per claim and « » ($ « ») 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.

§ 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.

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§ 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.)

« »

§ 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.

[« »] **§ 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

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§ 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	« »
Performance Bond	

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:

« »

DRAFT

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DRAFT

AIA® Document C132® – 2019

Standard Form of Agreement Between Owner and Construction Manager as Adviser

AGREEMENT made as of the « » day of «August » in the year «Two Thousand Twenty-Three »
(In words, indicate day, month and year.)

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

«County of Montgomery, Pennsylvania »« »
«Montgomery County Courthouse »
«PO Box 311 »
«Norristown, PA 19404-0311 »

and the Construction Manager:
(Name, legal status, address, and

«

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

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

The Owner and Construction Manager 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 A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; and B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition. 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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ARTICLE 1 INITIAL INFORMATION

§ 1.1 This Agreement is based on the Initial Information set forth in this Section 1.1.
(For each item in this section, insert the information or a statement such as "not applicable" or "unknown at time of execution.")

§ 1.1.1 The Owner's program for the Project:
(Insert the Owner's program, identify documentation that establishes the Owner's program, or state the manner in which the program will be developed.)

§ 1.1.2 The Project's physical characteristics:
(Identify or describe pertinent information about the Project's physical characteristics, such as size; location; dimensions; geotechnical reports; site boundaries; topographic surveys; traffic and utility studies; availability of public and private utilities and services; legal description of the site, etc.)

«See 1.1 above »

§ 1.1.3 The Owner's budget for the Cost of the Work, as defined in Section 6.1:
(Provide total and, if known, a line item breakdown.)

« The Owner's budget will be established subsequent to the parties' execution of this Agreement, and shall not include any fees, compensation and/or expense reimbursements to the Architect and/or for the pre-construction services or expense reimbursement of the Construction Manager relating thereto. The Owner, Construction Manager and Architect shall follow Target Value Design methods to assist in adhering to the Owner's budget during the design of the Project. »

§ 1.1.4 The Owner's anticipated design and construction milestone dates:

.1 Design phase milestone dates, if any:

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« »

.2 Construction commencement date:

«To be determined »

.3 Substantial Completion date or dates:

«To be determined »

.4 Other milestone dates:

« »

The parties shall establish milestone dates which shall be added by an appropriate amendment.

§ 1.1.5 The Owner intends the following procurement method for the Project:
(Identify method such as competitive bid or negotiated contract.)

«The Project is subject to the requirements of the Pennsylvania Separations Act (53 P.S. Section 1003) which require that the Owner publicly bid and award separate Contracts for the General Construction, Plumbing, HVAC and Electrical portions of the Project. Therefore, the Plan and Specifications and other design-related documents for the Work for the Project shall be designed and specified to ensure the Owner's compliance with this requirement. It is also contemplated that the Owner may issue separate Contracts to other Contractors to perform Work for the Project, other than for these portions of the Work. As part of its services as set forth under this Agreement, Construction Manager shall work with its consultants and the Architect in connection with estimating the Cost of the Work during the design phases, and in the planning, managing, coordinating and scheduling of the Work on the Project during construction to avoid and eliminate delays on the Project and to have all of the participants on the Project utilize and adhere to procedures promulgated by the Lean Construction Institute (collectively, the "Lean Procedures") while conforming to the requirements of the Separations Act to award separate contracts for the respective portions of construction (general, plumbing, HVAC and electrical). The Construction Manager shall assume and discharge its duties and responsibilities pursuant to the provisions of this Agreement, including the need for the preparation of separate bid documents and Contracts for each of the General Construction, Plumbing, HVAC and Electrical portions of the Project, as well as for any other separate Contractors performing Work on the Project, and delineating in the scope of Work for the Project as set forth in these documents which portion of the Work is the responsibility of each of these respective separate Contractors.
»

§ 1.1.6 The Owner's requirements for accelerated or fast-track design and construction, multiple bid packages, or phased construction are set forth below:
(Identify any requirements for fast-track scheduling or phased construction and, if applicable, list number and type of bid/procurement packages.)

« As a public Project subject to the Separations Act, it is contemplated that there will be multiple bid packages, with one bid package for the Contractor for each of the required separate portions of the Work (general construction, HVAC, electrical and plumbing). It is possible that there will be bid packages for the Project for work by other Contractors as well. A determination as to whether there will be accelerated or fast-track scheduling or phased construction will be made at a later date.
»

§ 1.1.7 The Owner's anticipated Sustainable Objective for the Project:
(Identify and describe the Owner's Sustainable Objective for the Project, if any.)

« »

§ 1.1.7.1 If the Owner identifies a Sustainable Objective, the Owner and Construction Manager shall complete and incorporate AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, into this Agreement to define the terms, conditions and services related to the Owner's Sustainable Objective. If E235–2019 is incorporated into this Agreement, the Owner and Construction Manager shall incorporate the completed

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E235–2019 into the agreements with the consultants and contractors performing services or Work in any way associated with the Sustainable Objective.

§ 1.1.8 Other Project information:
(Identify special characteristics or needs of the Project not provided elsewhere.)

« »

§ 1.1.9 The Owner identifies the following representative in accordance with Section 5.5:
(List name, address, and other contact information.)

«David Hahn »
«Capital Projects & Programs, County of Montgomery »
«PO Box 311 »
«425 Swede Street »
«Suite 613 »
«Norristown, PA 19404-0311 »

§ 1.1.10 The persons or entities, in addition to the Owner's representative, who are required to review the Construction Manager's submittals to the Owner are as follows:
(List name, address, and other contact information.)

« »

§ 1.1.11 The Owner or Architect shall retain the following consultants and Contractors:
(List name, legal status, address, and other contact information.)

.1 Land Surveyor:

«By Architect »« »
« »
« »
« »
« »

.2 Geotechnical Engineer:

«By Architect »« »
« »
« »
« »
« »

.3 Civil Engineer:

«By Architect »« »
« »
« »
« »
« »

.4 Contractors, as defined in Section 1.4:

«To be determined »

.5 Separate Contractors, as defined in Section 1.4:

« »

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.6 Other, if any:
(List any other consultants retained by the Owner.)

« Architect is responsible for evaluating the need for and retaining any and all additional consultants as required by the needs of the Architect to provide complete services and documentation throughout all phases of the Project. The Architect shall advise the Owner and Construction Manager in writing of the names and addresses of all third party Consultants, and shall make the Owner a third-party beneficiary of all services provided by said Consultants, The Owner shall have no financial obligation directly to the Architect's Consultants. »

§ 1.1.12 The Construction Manager identifies the following representative in accordance with Section 2.5:
(List name, address, and other contact information.)

«»
« »
« »
« »
« »

§ 1.1.13 The Construction Manager's staffing plan as required under Section 3.3.3 shall include:
(List any specific requirements and personnel to be included in the staffing plan, if know

§ 1.1.14 The Construction Manager's consultants retained under Basic Services, if any:
(List name, legal status, address, and other contact information of any consultants.)

« »

§ 1.1.15 The Construction Manager's consultants retained under Supplemental Services:

« »

§ 1.1.16 Other Initial Information on which this Agreement is based:

«See RFP »

§ 1.2 The Owner and Construction Manager may reasonably rely on the Initial Information. Both parties, however, recognize in accordance with the terms of this Agreement that the Initial Information may materially change and, in that event, the Owner and the Construction Manager shall appropriately adjust the Construction Manager's services, schedule for the Construction Manager's services, and the Construction Manager's compensation. The Owner shall adjust the Owner's budget for the Cost of the Work and the Owner's anticipated design and construction milestones, as necessary, to accommodate material changes in the Initial Information, in the event and to the extent such change(s) materially impact the Construction Manager's services and/or compensation.
§ 1.2.1 Relationship of the Parties The Construction Manager accepts the relationship of trust and confidence established by this Agreement and the applicable Contract Documents, and covenants with the Owner to cooperate with the Architect and respective Contractors, and exercise the Construction Manager's best skill, efforts and judgment in furthering the interests of the Owner; to furnish efficient construction administration, management services and supervision; and to ensure that the Contractors performing the Work and providing the services for the Project furnish at all times an adequate supply of workers and materials; and perform the Work in the best way and expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish or approve, in a timely manner, information required by the Construction Manager and to make payments to the Construction Manager in accordance with the requirements of the Contract Documents.

§ 1.3 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, to establish the protocols for the development, use, transmission, and exchange of digital data.

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§ 1.3.1 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 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, 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.

§ 1.4 The term "Contractors" refers to persons or entities who perform Work under contracts with the Owner that are administered by the Construction Manager and Architect. The term "Contractors" is used to refer to such persons or entities, whether singular or plural. The term does not include the Owner's own forces, or Separate Contractors, which are persons or entities who perform construction under separate contracts with the Owner not administered by the Construction Manager and Architect.

ARTICLE 2 CONSTRUCTION MANAGER'S RESPONSIBILITIES

§ 2.1 The Construction Manager shall timely and properly provide the services as set forth in this Agreement.

§ 2.2 The Construction Manager shall perform its services consistent with the skill, diligence and care ordinarily provided by construction managers practicing in the same or similar geographic area under the same or similar circumstances. The Construction Manager shall perform its services as expeditiously as is consistent with such skill and care and the orderly progress of the Project.

§ 2.3 The Construction Manager shall provide its services in conjunction with the services of an Architect as described in AIA Document B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition, as amended. The Construction Manager shall not be responsible for actions, inactions or other conduct on the part of the Architect. However, the foregoing shall not release the Construction Manager from any of its responsibilities hereunder.

§ 2.4 The Construction Manager shall coordinate its services with those services provided by the Owner, the Architect, the Contractors, and the Owner's other consultants and Separate Contractors. The Construction Manager shall be entitled to rely on, and shall not be responsible for, the accuracy and completeness of services and information furnished by the Owner, the Architect, and the Owner's other consultants and Separate Contractors unless otherwise prescribed herein. The Construction Manager shall provide prompt written notice to the Owner if the Construction Manager becomes aware of any error, omission, or inconsistency in such services or information.

§ 2.5 The Construction Manager shall identify a representative authorized to act on behalf of the Construction Manager with respect to the Project.

§ 2.6 The Construction Manager, as soon as practicable after execution of the Agreement, shall notify the Owner in writing of the names and qualifications of its proposed key staff members. Within 14 days of receipt of the names and qualifications of the Construction Manager's proposed key staff members, the Owner may reply to the Construction Manager in writing, stating (1) whether the Owner has reasonable objection to a proposed key staff member or (2) that the Owner requires additional time to review. Failure of the Owner to reply within the 14-day period shall constitute notice of no reasonable objection. The Construction Manager shall not staff any employees on the Project to whom the Owner has made reasonable and timely objection. The Construction Manager shall not change its key staff members without the Owner's consent, which shall not be unreasonably withheld or delayed.

§ 2.7 Except with the Owner's knowledge and consent, the Construction Manager shall not engage in any activity, or accept any employment, interest or contribution that would reasonably appear to compromise or adversely affect the Construction Manager's judgment with respect to this Project.

§ 2.8 The Construction Manager shall maintain the following insurance until termination of this Agreement. If any of the requirements set forth below are in addition to the types and limits the Construction Manager normally maintains, the Owner shall pay the Construction Manager as set forth in section 11.7.

§ 2.8.1 Occurrence Form Commercial General Liability with a coverage form at least as broad as ISO form CG0001:

.1 $5,000,000 Each Occurrence;
.2 $10,000,000 General Aggregate;

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.3 $2,000,000 Products/Completed Operations Aggregate;
.4 $1,000,000 Personal/Advertising Injury;
.5 Any restrictive endorsements must be identified.

§ 2.8.2 Business automobile Liability containing liability symbol "1" (any auto) covering vehicles owned, and non-owned vehicles used, by the Construction Manager with policy limits of not less than «One Million Dollars » ($ «1,000,000.00 ») 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.

§ 2.8.3 The Construction Manager 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 liability insurance policies result in the same or greater coverage as the coverages required under Sections 2.8.1 and 2.8.2, 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. The Construction Manager shall carry excess or umbrella liability insurance of $5,000,000.00 per occurrence and $5,000,000.00 aggregate.

§ 2.8.4 Workers' Compensation
.1 PA Statutory Coverage
.2 Employers Liability - Basic Limits.
.3 This policy shall contain a Waiver of Subrogation endorsement in favor of Montgomery County, PA; agents;
.4 The aforementioned Waiver of Subrogation will not be required after completion and final acceptance of the Project by the Owner.

§ 2.8.5 Professional Liability covering negligent acts, errors and omissions in the performance of professional services with policy limits of not less than «Twenty-Five Million Dollars » ($ «25,000,000.00 ») per claim and «Fifty Million Dollars » ($ «50,000,000.00 ») in the aggregate.

§ 2.8.6 Additional Insured Obligations. To the fullest extent permitted by law, the Construction Manager shall cause the primary and excess or umbrella polices for Commercial General Liability and Automobile Liability to include the Owner as an additional insured for claims caused in whole or in part by the Construction Manager's negligent acts or omissions. The additional insured coverage shall be primary and non-contributory to any of the Owner's insurance policies and shall apply to both ongoing and completed operations.

§ 2.8.7 Prior to the commencement of any work under this Agreement, the Construction Manager shall provide certificates of insurance to the Owner all of the aforementioned coverages as well as the original Waiver of Subrogation and Additional Insured endorsements required by this § 2.6. Said endorsements shall be signed by the issuer and shall bear the policy number to which each applies and shall be attached to the certificate. The certificate will show the following name and address as certificate holder and Additional Insured as provided above:

Montgomery County, Pennsylvania
Montgomery County Courthouse
PO Box 311
Norristown, PA 19404-0311
Attention: Chief Operating Officer

and will further state that the certificate holder will receive written notice by certified mail 30 days prior to cancellation, reduction or non-renewal of any coverage provided by any of the policies listed on the certificate. The cancellation notice provisions of the certificate will be amended and initialed by the issuer to assure that the delivery of such notice to the certificate holder will be guaranteed.

§ 2.8.7.1 Said certificate(s) will indicate the applicable policy numbers and effective and expiration dates of said policies and will bear the original signature of the issuer.

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§ 2.8.8 All of the coverages required by this Agreement shall be underwritten by insurance companies licensed to do business in the state in which the Project is located and whose financial rating is at least A-X in the most recently published A.M. Best Rating Guide.

§ 2.8.9 Construction Manager shall not permit any of the required coverages to expire. 30 days prior to expiration of any policy and/or endorsement required hereunder the Construction Manager shall furnish to the Owner new certificates and endorsements evidencing the renewal of all required coverages and shall continue to furnish to Owner such evidences of renewal of all required coverages for a period of 12 years following completion of the Project.

§ 2.8.10 Construction Manager will notify Owner immediately in writing when it knows or should have known that its insurance policy is or will be canceled, not renewed, or reduced.

§ 2.8.11 Failure of Owner to enforce any of the provisions of this Agreement shall in no way relieve the Construction Manager of any of its obligations pursuant to this Agreement or pursuant to any other portion of this contract.

§ 2.8.12 If Construction Manager fails to provide such required insurance coverage and/or adequate proof of current coverage in amounts required, the Owner shall have the right to treat such failure as a material breach of the contract and to exercise all appropriate rights and remedies.

§ 2.8.13 The Owner reserves the right to review categories and levels of insurance coverage held by the Construction Manager in an ongoing program of risk management. The Construction Manager will be notified, in writing, of coverage requirements as determined by this review and Construction Manager agrees to secure such requested coverage.

§ 2.8.14 The inclusion of more than one insured in this policy shall not affect the rights of any insured as respects any claim, demand, suit or judgment made or brought by or for any other insured. This policy shall protect each insured in the same manner as though a separate policy has been issued to each, but the inclusion here of more than one insured shall not serve to increase the limit of the insurer's liability.
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§ 2.9 The Construction Manager shall assist the Owner, Architect, and other Project participants in establishing building information modeling and digital data protocols for the Project using AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 2.10 A centralized electronic document management system will be used on the Project, and the Construction Manager shall be designated the Responsible Project Participant in section 3.5 of E203-2013, responsible for managing and maintaining the centralized electronic document management system. The centralized electronic document management system shall include all items listed in Article 3 of E203, and the following:
(*List any items to be included that are not listed in Article 3 of E203-2013.)*

« »

§ 2.11 The Construction Manager shall retain all Project related documents and information it receives, and the Owner and Architect shall have access to the documents and information. The Construction Manager shall transmit the documents and information to the Owner at final completion.

§ 2.12 Lean Procedures

As set forth in § 1.1.1, it is the desire of the Owner to implement and have all of the participants on the Project – the Contractors and the Construction Manager -- utilize procedures promulgated by the Lean Construction Institute collectively, including Target Value Design and Last Planner methods. The obligations and duties of the Construction Manager as set forth throughout this Agreement are intended to identify various measures, procedures and protocols to be undertaken by the respective Contractors with the objective of achieving the goals and results by the Lean Construction Institute. Requirements imposed upon the Construction Manager shall be implied, if not expressed, in the Construction Manager's assumption and discharge of its duties and responsibilities pursuant to the provisions of this Agreement, including the need coordinate the work of the Contractors for the Project responsible for each of the

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General Construction, Plumbing, HVAC and Electrical portions of the Project, as well as any Work to be performed by other Contractors. These activities and objectives include, but are not limited to:

.1 The reduction of costs, materials, time and effort by coordination, cooperation and advanced joint planning by the Contractors;
.2 The minimizing wasteful aspects of traditional construction project activities and time delay;
.3 The clear and concise understanding of project materials and information;
.4 Using less materials and having less waste;
.5 Reducing construction time by increased planning and strategic vision;
.6 Fewer accidents and a higher rate of safety through increased worker focus and understanding;
.7 Improve overall results due to increased communication and few workers;
.8 Decreased stress for workers and management due to few works;
.9 Increased schedule reliability and predictability;
.10 Increase contractor/subcontractor and worker accountability;
.11 Increased job satisfaction resulting in better performance commitments;
.12 Decentralized decision making resulting in empowerment of workers on the front line to anticipate and deal with contingencies and unforeseen events;
.13 Adopt a "last planner" approach to work flow, and encourage flexibility in planning and implementation;
.14 In initiating and modifying Approved Project Schedules, provide for "swing space" to facilitate the relocation of the occupants of the Project, but also to enable the Contractors to redeploy trades so that if there is any delay or obstruction to the progress of the Work on the Project, alternative Work areas are available to minimize time lost to inefficiency or disruption;
.15 Minimize the amount of materials being stored for longer than necessary on the Project Site by having an integrated schedule for all of the Contractors in order to get materials onto and waste off of the Project Site quickly, and frequently;
.16 Use modular construction and off-site fabrication consistent with labor work practices;
.17 Early engagement of commissioning agent(s);
.18 Facilitate design reviews by and among the Architect, Construction Manager and Owner to analyze operational philosophy before the design is completed;
.19 Among other things, utilize Lean Last Planner procedures to create a collaborative team environment among all who manage and perform the Work with the objective to eliminate unnecessary tasks, keep excess materials off of the Project site, to help improve the overall production process and create a more predictable production program, ensure that that everything necessary to perform the Work is in place before a task is scheduled to start, create a safer work environment and accelerate the workflow of the Project; and
.20 The Lean Procedures set forth in the General Conditions.

ARTICLE 3 SCOPE OF CONSTRUCTION MANAGER'S BASIC SERVICES

§ 3.1 Definition

The Construction Manager's Basic Services consist of those described in this Article 3, RFP 23-14, and include usual and customary Preconstruction and Construction Phase Services. Services not set forth in this Article 3 and RFP 24-14 are Supplemental or Additional Services. The Owner, Construction Manager, and Contractors may agree, in consultation with the Architect, for the Construction Phase to commence prior to completion of the Preconstruction Phase, in which case, both phases will proceed concurrently.

§ 3.2 Preconstruction Phase

§ 3.2.1 The Construction Manager shall review the information furnished by the Owner and any development and/or evaluation of the Owner's program provided by the Architect, to ascertain the requirements of the Project and shall arrive at a mutual understanding of such requirements with the Owner and Architect prior to the solicitation of bids by the Owner for Work on the Project. The Construction Manager shall schedule and conduct preconstruction meetings with the Architect and Owner on a biweekly basis or as needed to discuss such matters as procedures, progress, problems, coordination, and scheduling of the Work, and shall prepare and promptly distribute minutes to all attendees. The Construction Manager shall further consult with, advise, assist and make recommendations to the Owner and Architect on all aspects of Project planning.

§ 3.2.2 The Construction Manager shall provide a preliminary evaluation of the Owner's program, schedule and construction budget requirements, each in terms of the other and consistent with the requirements herein.

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§ 3.2.3 The Construction Manager shall prepare, and deliver to the Owner, for the Owner's approval, a written Construction Management Plan that includes, at a minimum, the following: (1) preliminary evaluations required in Section 3.2.2, (2) a Project schedule (which term may be referred to alternately as the "Approved Project Schedule"), (3) cost estimates, (4) recommendations for Project delivery method, and (5) proposed Project Site use and improvements, selection of materials, building systems and equipment and methods of performing the Work, and staging of materials and equipment and (6) the respective Contractors' scopes of Work. The Construction Manager shall periodically update the Construction Management Plan, for the Owner's approval, over the course of the Project.

§ 3.2.4 The Construction Manager shall prepare and periodically update the Approved Project schedule included in the Construction Management Plan for the Architect's review and the Owner's acceptance. The Construction Manager shall obtain the Architect's approval for the portion of the Approved Project Schedule relating to the performance of the Architect's services. The Approved Project schedule shall coordinate and integrate the Construction Manager's services, the Architect's services, other Owner consultants' services, and the Owner's responsibilities and the performance of the Work by the Contractors, and highlight items that could affect the Project's timely completion. The updated Approved Project Schedule shall include the following: the award of the separate Contracts for the Work; components of the Work; times of commencement and completion required of each Contractor and their Subcontractors and major vendors and suppliers; ordering and delivery of products, including those that must be ordered well in advance of construction; and the relocation and occupancy requirements of the Owner and its tenants showing portions of the Project having occupancy priority, and the proposed date of Substantial Completion of each portion of the Work..

§ 3.2.5 The Construction Manager shall update the Approved Project schedule to include the components of the Work, including phasing of construction, times of commencement and completion required of each Contractor, ordering and delivery of products, including those that must be ordered in advance of construction, obtaining the required reviews and approvals of authorities having jurisdiction over the Project, and the occupancy requirements of the Owner.

§ 3.2.6 Based on the preliminary design and information prepared or provided by the Architect and other Owner consultants, the Construction Manager shall prepare, for the Architect's review and Owner's approval, preliminary estimates of the Cost of the Work or the cost of program requirements using area, volume or similar conceptual estimating techniques, including the establishment of sufficient contingency to reasonably anticipate the development of the Project's design documents.

§ 3.2.7 The Construction Manager shall expeditiously review design documents during their development and advise the Owner and Architect on proposed site use and improvements, selection of materials, building systems, and equipment. The Construction Manager shall also provide recommendations to the Owner and Architect, consistent with the Project requirements, on constructability; availability of materials and labor; sequencing for phased construction; time requirements for procurement, installation and construction; and factors related to construction cost including, but not limited to, costs of alternative designs or materials, preliminary budgets, life-cycle data, and possible cost reductions. As part of this process, the Construction Manager shall assist the Architect in implementing Target Value Design precepts during the design process, including, but not limited to:

- **.1** design based upon a detailed estimate;
- **.2** designing for what is constructible;
- **.3** working together to define the issues and produce decisions, and then design to those designs;
- **.4** carry solution sets far into the design process;
- **.5** create conceptual design alternatives and seek to determine whether the Project may be built for the allowable cost;
- **.6** continually update cost estimating and budgeting; and
- **.7** work together in the design development so that the Architect has the benefit of the Construction Manager's input as the design is being developed.

§ 3.2.8 The Construction Manager shall review recommendations for systems, materials, or equipment for the impact upon cost, schedule, sequencing, constructability, and coordination among the Contractors. The Construction Manager shall discuss its findings with the Owner and the Architect, and coordinate resolution, as necessary, of any such impacts.

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§ 3.2.9 As the Architect progresses with the preparation of the Concept Design Studies, Schematic Design, Design Development and Construction Documents, the Construction Manager shall prepare and update, at appropriate intervals agreed to by the Owner, Construction Manager and Architect, an estimate of the Cost of the Work with increasing detail and refinement. The Construction Manager shall include in the estimate those costs to allow for further development of the design, bidding or negotiating, price escalation, and market conditions. The estimate shall be provided for the Architect's review and the Owner's approval. The Construction Manager shall inform the Owner and Architect in the event that the estimate of Cost of the Work exceeds the latest approved Project budget, and make recommendations for corrective action pursuant to Section 6.4..

§ 3.2.10 As the Architect progresses with the preparation of the Concept Design Studies, Schematic Design, Design Development and Construction Documents, the Construction Manager shall consult with the Owner and Architect and make recommendations whenever the Construction Manager determines that the design, or details, adversely affect cost, scope, schedule, constructability, or quality of the Project.

§ 3.2.11 The Construction Manager shall provide recommendations and information to the Owner and Architect regarding the assignment of responsibilities for temporary Project facilities and equipment, materials and services for common use of the Contractors. The Construction Manager shall verify that such requirements and assignment of responsibilities are included in the proposed Contract Documents.

§ 3.2.12 The Construction Manager shall provide recommendations and information to the Owner regarding the allocation of responsibilities for safety programs among the Contractors.

§ 3.2.13 The Construction Manager shall provide recommendations to the Owner on the division of the Project into individual contracts for the respective Contractors, subject to the requirements of the Separations Act and public bidding, for the construction of various categories of Work, including the method to be used for identifying responsible and responsive Contractors and awarding Contracts for Construction. The Construction Manager shall review the Drawings and Specifications during preparation and upon completion by the Architect and make recommendations as required to provide that (1) the Work of the Contractors is coordinated, (2) all requirements for the Project are assigned to the appropriate Contract, (3) the likelihood of jurisdictional disputes is minimized, and (4) proper coordination is provided for phased construction.

§ 3.2.14 The Construction Manager shall make recommendations about, and coordinate the ordering and delivery of, materials in support of the Approved Project Schedule, including those that must be ordered in advance of construction.

§ 3.2.15 The Construction Manager shall assist the Owner and Architect in selecting, retaining, and coordinating the professional services of surveyors, geotechnical engineers, special consultants, and construction materials testing required for the Project.

§ 3.2.16 The Construction Manager shall provide an analysis to the Owner and the Architect of the types and quantities of labor required for the Project and review the availability of appropriate categories of labor required for critical phases. The Construction Manager shall make recommendations to the Owner and the Architect for actions designed to minimize adverse effects of labor shortages.

§ 3.2.17 The Construction Manager shall assist the Owner in obtaining information regarding applicable requirements for equal employment opportunity programs, and other programs as may be required by governmental and quasi-governmental authorities and other agencies having jurisdiction for inclusion in the Contract Documents. The Construction Manager shall assist the Owner and Architect in reviewing the requirements of governmental authorities and quasi-governmental and other agencies having jurisdiction, and advise on the cost and/or schedule impact and suggest possible alternatives

§ 3.2.18 Following the Owner's acceptance of the pre-bid Drawings and Specifications, the Construction Manager shall update and submit the latest estimate of the Cost of the Work and the Project schedule for the Architect's review and the Owner's acceptance.

§ 3.2.19 The Construction Manager, in consultation with the Owner, shall develop bidders' interest in the Project and establish bidding schedules for the public solicitation of bids for the Project. The Construction Manager shall assist the Owner and the Architect with the development of the Bidding Documents, which consist of bidding requirements and

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proposed Contract Documents. The Construction Manager, with the assistance of the Architect, shall issue Bidding Documents to bidders and conduct pre-bid conferences with prospective bidders. The Construction Manager shall issue the current Project schedule with each set of Bidding Documents. The Construction Manager shall assist the Architect with regard to questions from bidders and with the issuance of addenda.

§ 3.2.20 The Construction Manager shall make recommendations to the Owner and Architect regarding the division of work in the Drawings and Specifications to facilitate the bidding and awarding of separate contracts, consistent with the public bidding requirements and the Separations Act, taking into consideration such factors as the time of performance, availability of labor, overlapping trade jurisdictions, provisions for temporary facilities, and so forth. The Construction Manager shall also provide an analysis of the types and quantities of labor required for the Work and review the availability of appropriate categories of labor required for various phases and make recommendations for actions designed to minimize adverse effects for labor shortages.
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§ 3.2.21 The Construction Manager, with the assistance of the Architect, shall receive and review bids, and prepare bid analyses, and make recommendations to the Owner for the Owner's award of Contracts for Construction or rejection of bids consistent with public bidding requirements and the Separations Act.

§ 3.2.22 The Construction Manager, with the assistance of the Architect, shall assist the Owner in preparing Contracts for Construction. The Construction Manager shall advise the Owner regarding Subcontractors and material suppliers proposed by Contractors.

§ 3.2.23 The Construction Manager shall assist the Owner and Architect and Contractors in obtaining building permits and special permits for permanent improvements, except for permits required to be obtained directly by the Contractors. The Construction Manager shall verify that the Owner has paid applicable fees and assessments relating to the Project. The Construction Manager shall assist the Owner and Architect in connection with the Owner's responsibility for filing documents required for the approvals of agencies, governmental and quasi-governmental authorities having jurisdiction over the Project.

§ 3.2.24 If the Owner identified a Sustainable Objective in Article 1, the Construction Manager shall fulfill its Preconstruction Phase responsibilities as required in AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, attached to this Agreement.

§ 3. 2.25 The Construction Manager shall provide recommendations with regard to accelerated or fast-track scheduling, procurement, or phased construction. The Construction Manager shall take into consideration cost reductions, cost information, constructability, provisions for temporary facilities and procurement and construction scheduling issues consistent with public bidding requirements and the Separations Act.

§ 3.2.26 At the Owner's direction, the Construction Manager shall prepare and periodically update an itemized cash flow schedule showing the expected monthly draw on a trade-by-trade basis.

§ 3.2.27 The Construction Manager shall prepare, for the Architect's review and the Owner's acceptance, a procurement schedule for items that must be ordered well in advance of construction. The Construction Manager shall expedite and coordinate the ordering and delivery of materials that must be ordered well in advance of construction. If the Owner agrees to procure any items prior to the submission of public bids for the Work which includes such materials, the Owner shall procure the items on terms and conditions acceptable to the Construction Manager and the bid documents shall provide that such materials or the purchase orders therefor shall be assigned to the successful bidder for such Work. Upon the award of the Contracts for any Work to a Contractor, the Owner shall assign all contracts for these items to the applicable Contractor performing such Work who shall thereafter accept responsibility for them.

§ 3.3 Construction Phase

§ 3.3.1 The Construction Manager shall provide on-site administration of the Contracts for Construction in cooperation with the Architect as set forth below and in AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as amended.

§ 3.3.2 Subject to Section 4.2 and except as provided in Section 3.3.30, the Construction Manager's responsibility to provide Construction Phase Services commences with the award by the Owner of the initial Contract for Construction

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to a Contractor for the Project and terminates on the date the Architect issues the final Certificate for Payment for the entire Project.

§ 3.3.3 The Construction Manager shall provide a staffing plan to include one or more representatives who shall be in attendance at the Project site whenever the Work is being performed.

§ 3.3.4 The Construction Manager shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Contractors with each other and with those of the Construction Manager, the Owner and the Architect. The Construction Manager shall coordinate the activities of the Contractors in accordance with the latest Approved Project Schedule and the Contract Documents.

§ 3.3.5 The Construction Manager shall review and analyze the construction schedules provided by the respective Contractors to update the Approved Project Schedule, incorporating the activities of the Owner, Architect, and Contractors on the Project, including activity sequences and durations, allocation of labor and materials, processing of Shop Drawings, Product Data and Samples, and delivery and procurement of products, including those that must be ordered in advance of construction. The Approved Project Schedule shall include the Owner's occupancy requirements showing portions of the Project having occupancy priority. The Construction Manager shall update and reissue the Approved Project Schedule as required to show current conditions. If an update indicates that the previously Approved Project Schedule may not be met, the Construction Manager shall recommend corrective action to the Owner and Architect and a plan shall be required of the Contractors to ensure timely compliance with the Approved Project Schedule.

§ 3.3.6 The Construction Manager shall schedule and conduct meetings to discuss matters such as procedures, timing and sequencing of Work, progress, coordination, and scheduling of the Work, and for the storage of materials and equipment, and to develop solutions to issues identified. The Construction Manager shall prepare and promptly distribute minutes to the Owner, Architect and Contractors.

§ 3.3.7 In accordance with the Contract Documents and the latest Approved Project Schedule, and utilizing information from the Contractors, the Construction Manager shall review, analyze, schedule and coordinate the overall sequence of construction and assignment of space in areas where the Contractors are performing Work.

§ 3.3.8 The Construction Manager, in conjunction with the Architect, shall coordinate all tests and inspections required by the Contract Documents or governmental authorities, observe the on-site testing and inspections, and arrange for the delivery of test and inspection reports to the Owner and Architect.

§ 3.3.9 The Construction Manager shall endeavor to obtain satisfactory performance from each of the Contractors. The Construction Manager shall recommend courses of action to the Owner when requirements of a Contract are not being timely and/or properly fulfilled.

§ 3.3.10 The Construction Manager shall monitor and evaluate actual costs for activities in progress and estimates for uncompleted tasks and advise the Owner and Architect as to variances between actual costs and budgeted or estimated costs. If a Contractor is required to submit a Control Estimate, the Construction Manager shall meet with the Owner, Architect and Contractor to review the Control Estimate. The Construction Manager shall promptly notify the Contractor if there are any inconsistencies or inaccuracies in the information presented. The Construction Manager shall also report the Contractor's cost control information to the Owner and the Architect.

§ 3.3.11 The Construction Manager shall develop cash flow reports and forecasts for the Project and include them in the Construction Manager's progress reports.

§ 3.3.12 The Construction Manager shall maintain accounting records on authorized Work performed under unit costs, additional Work performed on the basis of actual costs of labor and materials, and other Work requiring accounting records.

§ 3.3.12.1 The Construction Manager in conjunction with the Architect shall develop and implement procedures for the review and processing of Applications for Payment by Contractors for progress and final payments.

§ 3.3.12.2 Not more frequently than monthly, the Construction Manager shall review and certify the amounts due the respective Contractors as follows:

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.1 Intentionally omitted.

.2 The Construction Manager shall, within seven days after the Construction Manager receives each Contractor's Application for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each Contractor; (2) prepare a Summary of Contractors' Applications for Payment by summarizing information from each Contractor's Application for Payment; (3) prepare a Project Application and Certificate for Payment; (4) certify the total amount the Construction Manager determines is due all Contractors collectively; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect. The Construction Manager shall advise the Owner in writing of the basis for the withholding of any payment in a timely manner so as to allow the Owner to so advise the Contractor.

§ 3.3.12.3 The Construction Manager's certification for payment shall constitute a representation to the Owner, based on the Construction Manager's evaluations of the Work and on the data comprising the Contractors' Applications for Payment, 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 the Contractors are entitled to payment in the amount certified. The foregoing representations are subject to (1) an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion; (2) results of subsequent tests and inspections; (3) correction of minor deviations from the Contract Documents prior to completion; and (4) specific qualifications expressed by the Construction Manager. The issuance of a Certificate for Payment shall further constitute a recommendation to the Architect and Owner that the Contractor be paid the amount certified.

§ 3.3.12.4 The certification of an Application for Payment or a Project Application for Payment by the Construction Manager shall not be a representation that the Construction Manager has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, procedures, or sequences for a Contractor's own Work; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate each Contractor's right to payment; or (4) ascertained how or for what purpose that Contractor has used money previously paid on account of the Contract Sum.

§ 3.3.13 The Construction Manager shall obtain and review the safety programs developed by each Contractor solely and exclusively for purposes of coordinating the safety programs with those of the other Contractors and for making recommendations for any additional safety measures to be considered in the Work of the Contractors. The Construction Manager's responsibilities for coordination of safety programs shall not extend to direct 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 and not directly employed by the Construction Manager.

§ 3.3.14 The Construction Manager shall determine in general that the Work of each Contractor is being performed in accordance with the requirements of the Contract Documents applicable thereto and promptly notify the Owner, Contractor and Architect of defects and deficiencies in the Work. The Construction Manager shall have the authority to reject Work that does not conform to the applicable Contract Documents and shall notify the Architect and Owner about the rejection. The failure of the Construction Manager to reject Work shall not constitute acceptance of the Work. The Construction Manager shall record any rejection of Work in its daily log and include information regarding the rejected Work in its progress reports to the Architect and Owner pursuant to Section 3.3.22.1. Upon written authorization from the Owner, the Construction Manager may require and make arrangements for additional inspection or testing of the Work in accordance with the provisions of the applicable Contract Documents, whether or not the Work is fabricated, installed or completed, and the Construction Manager shall give timely notice to the Architect of when and where the tests and inspections are to be made so that the Architect may be present for such procedures.

§ 3.3.15 The Construction Manager shall advise and consult with the Owner and Architect during the performance of its Construction Phase Services. The Construction Manager shall have authority to act on behalf of the Owner only to the extent expressly provided in this Agreement. The Construction Manager shall not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work of each of the Contractors, since these are solely the Contractor's rights and responsibilities under the applicable Contract Documents. The Construction Manager shall not be responsible for a Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Construction Manager shall be responsible for the Construction Manager's negligent acts or omissions, and those of

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its subcontractors, agents, employees, or any other persons or entities performing services under this Agreement, but shall not have control over or charge of, and shall not be responsible for, acts or omissions of the Contractors, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work under their respective Contracts. The foregoing shall not relieve the Construction Manager of its responsibilities as set forth herein.

§ 3.3.16 The Construction Manager shall timely transmit to the Architect requests for interpretations, and requests for information of the meaning and intent of the Drawings and Specifications, and provide its written recommendation. The Construction Manager shall assist in the resolution of questions that may arise.

§ 3.3.17 The Construction Manager shall review requests for changes, assist in negotiating the Contractors' proposals, submit recommendations to the Architect and Owner, and, if the proposed changes are accepted or required by the Owner, prepare Change Orders or Construction Change Directives that incorporate the Architect's modifications to the respective Contract Documents.

§ 3.3.18 Intentionally omitted.

§ 3.3.19 Utilizing the submittal schedules provided by each Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 3.3.20 The Construction Manager shall promptly review all Shop Drawings, Product Data, Samples, and other submittals from the Contractors for compliance with the submittal requirements of the Contract, coordinate submittals with information contained in related documents, and transmit to the Architect those that the Construction Manager recommends for approval. **T**he Construction Manager's actions shall be taken in accordance with the Project submittal schedule approved by the Architect and Construction Manager, or in the absence of an approved Project submittal schedule, with such reasonable promptness as to cause no delay in the Work or in the activities of the Contractors, the Owner, or the Architect.

§ 3.3.20.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractors by the Contract Documents, the Construction Manager shall promptly review those submittals for sequencing, constructability, and coordination impacts on the other Contractors. The Construction Manager shall discuss and document its findings with the Owner and the Architect, and coordinate resolution, as necessary, of any such impacts.

§ 3.3.21 The Construction Manager shall keep a daily log containing a record of weather, each Contractor's Work on the site, number of workers, identification of equipment, Work accomplished, problems encountered, and other similar relevant data as the Owner may require. The daily log shall be in sufficient detail to allow identification and evaluation of productivity, delays, impacts or any other issues related to the completion of the Work.

§ 3.3.21.1 The Construction Manager shall collect, review for accuracy, and compile the Contractors' daily logs; and include them in the Construction Manager's reports prepared and submitted in accordance with section 3.3.21.2.

§ 3.3.21.2 The Construction Manager shall record the progress of the Project. On a monthly basis, or otherwise as agreed to by the Owner, the Construction Manager shall submit written progress reports to the Owner and Architect, showing percentages of completion and other information identified below:

- **.1** Work completed for the period;
- **.2** Approved ProjectSschedule status;
- **.3** Submittal schedule and status report, including a summary of remaining and outstanding submittals;
- **.4** Request for information, Change Order, and Construction Change Directive status reports;
- **.5** Tests and inspection reports;
- **.6** Status report of nonconforming and rejected Work;
- **.7** Daily logs;
- **.8** Summary of all Contractors' Applications for Payment;
- **.9** Cumulative total of the Cost of the Work to date including the Construction Manager's compensation and reimbursable expenses at the job site, if any;

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.10 Cash-flow and forecast reports;
.11 Photographs to document the progress of the Project;
.12 **S**tatus reports on permits and approvals of authorities having jurisdiction; and
.13 Any other items the Owner may require:

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§ 3.3.22 Utilizing the documents provided by the respective Contractors, the Construction Manager shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Owner, Architect, and Contractors. Upon completion of the Project, the Construction Manager shall deliver them to the Owner.

§ 3.3.23 The Construction Manager shall arrange for the delivery, storage, protection and security of Owner-purchased materials, systems and equipment that are a part of the Project until such items are incorporated into the Work, and shall coordinate the Contractors to ensure proper delivery, storage, protection and security of Contractor-purchased materials, systems and equipment that are a part of the Project.

§ 3.3.24 With the Architect and Owner's maintenance personnel, the Construction Manager shall observe each of the Contractors' final testing and start-up of utilities, operational systems and equipment and observe any commissioning as the Contract Documents may require.

§ 3.3.25 When the Construction Manager considers each Contractor's Work or a designated portion thereof substantially complete, the Construction Manager shall, jointly with that Contractor and the Owner, and the Contractor, if necessary, prepare a list of incomplete or unsatisfactory items and a schedule for their completion. The Construction Manager shall assist the Architect in conducting inspections to determine whether the Work or designated portion thereof is substantially complete.

§ 3.3.26 When the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager shall prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion. The Construction Manager shall submit the executed Certificate to the Owner and Contractors. The Construction Manager shall coordinate the correction and completion of the Work. Following issuance of a Certificate of Substantial Completion of the Work or a designated portion thereof, the Construction Manager shall perform an inspection to confirm the completion of the Work of the Contractors and make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection. The Construction Manager shall assist the Architect in conducting the final inspection.

§ 3.3.27 The Construction Manager shall forward to the Owner, with a copy to the Architect, the following information received from the Contractors: (1) certificates of insurance ; (2) consent of surety or sureties, if any, to reduction in or partial release of retainage or the making of final payment; (3) affidavits, receipts, releases and waivers of liens or bonds indemnifying the Owner against liens; and (4) any other documentation required of the Contractors under the Contract Documents, including warranties and similar submittals. Such shall be in the form and content required by the respective Contract Documents.

§ 3.3.28 The Construction Manager shall coordinate receipt, and delivery to the Owner, of other items provided by the Contractors, such as keys, manuals, and record drawings. The Construction Manager shall forward to the Architect, with a copy to the Owner, a final Project Application for Payment and Project Certificate for Payment, or a final Application for Payment and final Certificate for Payment, upon the Contractors' compliance with the requirements of the applicable Contract Documents.

§ 3.3.29 Duties, responsibilities and limitations of authority of the Construction Manager as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Construction Manager, Architect, and Contractors. Consent shall not be unreasonably withheld.

§ 3.3.30 Upon request of the Owner, and prior to the expiration of one year from the date of Substantial Completion, the Construction Manager shall, without additional compensation, conduct a meeting with the Owner and Architect to review the facility operations and performance.

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§ 3.3.31 The Construction Phase shall commence upon the Owner's issuance of a Notice to Proceed.

§ 3.4 Administration

§ 3.4.1 During the bidding period, the Construction Manager shall receive, tabulate and forward to the Owner and Architect inquiries of bidders for the Project together with recommendations of action to be taken regarding the same. The Architect will prepare necessary Addenda and issue same, subject to the approval of the Owner and subject to any applicable public bidding requirements.

§ 3.4.2 Upon the award of the Contracts to the Contractors, the Construction Manager shall prepare and submit to the Owner and Architect a refined, detailed construction schedule, consistent with the Approved Project Schedule, for the Work and a submittal schedule in accordance with the General Conditions.

§ 3.4.3 On a monthly basis, the Construction Manager shall provide current working schedules incorporating schedules provided by the Contractors and demonstrating progress with respect to the Agreed Construction Schedule. Such working schedules shall incorporate the activities of all of the Contractors, including activity sequences and ratios, allocation of labor and materials, processing of Shop Drawings, Product, Data and Samples, and delivery of products requiring long lead time procurement. Such working schedules shall also include the Owner's relocation and occupancy requirements showing portions of the Property having occupancy priority. The monthly working schedule shall be updated to show progress as compared to the Approved Project Schedule, reflecting current conditions and revisions required by actual experience.

§ 3.4.5 The Construction Manager shall develop a system of cost control for the Work, including regular monitoring of actual costs for activities in progress and estimates for uncompleted tasks and proposed changes. The Construction Manager shall identify variances between actual and estimated costs and report the variances to the Owner and Architect and shall provide this information in its monthly reports to the Owner and Architect, showing for each Contract: (1) the current Schedule of Values, (2) all approved Change Orders affecting each line item, (3) the current Contract Sum as adjusted by the approved Change Orders, (4) all committed costs by Schedule of Values line item, (5) pending (but not yet approved) cost commitments and (6) anticipated cost by line item, which is the sum of committed costs and pending commitments.

§ 3.4.6 The Construction Manager shall plan and schedule the Work so as to (1) prevent disruption, interruption, or interference with the Owner's operations, and (2) minimize the curtailment of Owner's access to any critical areas of the Property for any period of time. Prior to the commencement of any Work affecting any critical areas of the Property, Owner shall review and approve all work schedules and plans. No fewer than fourteen days prior to the proposed commencement of any Work which may affect electrical, mechanical or other services to existing building operations or occupants, it shall be the Construction Manager 's responsibility to provide the Owner with a statement describing in detail the time schedule, procedure and sequence of each task, the potential risk to the facility and the Construction Manager's approach to eliminating or mitigating the risk, the name of site personnel responsible for performing and supervising tasks. Prior to commencement of construction, the Construction Manager shall create for the Owner and Architect's review a schedule of such statements which it anticipates will be necessary for the Work and shall maintain and update the schedule throughout construction.

ARTICLE 4 SUPPLEMENTAL AND ADDITIONAL SERVICES

§ 4.1 Supplemental Services

§ 4.1.1 The services listed below are not included in Basic Services but may be required for the Project. The Construction Manager shall provide the listed Supplemental Services only if specifically designated in the table below as the Construction Manager's responsibility, and the Owner shall compensate the Construction Manager as provided in Section 11.2. Unless otherwise specifically addressed in this Agreement, if neither the Owner nor the Construction Manager is designated, the parties agree that the listed Supplemental Service is not being provided for the Project. *(Designate the Construction Manager's Supplemental Services and the Owner's Supplemental Services required for the Project by indicating whether the Construction Manager or Owner shall be responsible for providing the identified Supplemental Service. Insert a description of the Supplemental Services in Section 4.1.2 below or attach the description of services as an exhibit to this Agreement.)*

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Supplemental Services		Responsibility *(Construction Manager, Owner or not provided)*
§ 4.1.1.1	Measured drawings	
§ 4.1.1.2	Tenant-related services	
§ 4.1.1.3	Commissioning	Basic Service
§ 4.1.1.4	Development of a commissioning plan	Basic Service
§ 4.1.1.5	Sustainable Project Services pursuant to Section 4.1.3	
§ 4.1.1.6	Furniture, furnishings and equipment delivery, and installation coordination	Basic Service
§ 4.1.1.7	Furniture, furnishings and equipment procurement assistance	Basic Service
§ 4.1.1.8	Assistance with site selection	
§ 4.1.1.9	Assistance with selection of the Architect	
§ 4.1.1.10	Furnish land survey	
§ 4.1.1.11	Furnish geotechnical engineering services	
§ 4.1.1.12	Provide insurance advice	
§ 4.1.1.13	Provide supplemental Project risk analysis and mitigation strategies	Basic Service
§ 4.1.1.14	Stakeholder relationships management	Basic Service
§ 4.1.1.15	Owner moving coordination	
§ 4.1.1.16	Coordination of Owner's Separate Contractors	Basic Service
§ 4.1.1.17	Other Supplemental Services	

§ 4.1.2 Description of Supplemental Services

§ 4.1.2.1 A description of each Supplemental Service identified in Section 4.1.1 as the Construction Manager's responsibility is provided below.

(Describe in detail the Construction Manager's Supplemental Services identified in Section 4.1.1 or, if set forth in an exhibit, identify the exhibit.)

« »

§ 4.1.2.2 A description of each Supplemental Service identified in Section 4.1.1 as the Owner's responsibility is provided below.

(Describe in detail the Owner's Supplemental Services identified in Section 4.1.1 or, if set forth in an exhibit, identify the exhibit.)

« »

§ 4.1.3 If the Owner identified a Sustainable Objective in Article 1, the Construction Manager shall provide, as a Supplemental Service, the Sustainability Services required in AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, attached to this Agreement. The Owner shall compensate the Construction Manager as provided in Section 11.2.

§ 4.2 Construction Manager's Additional Services

§ 4.2.1 The Construction Manager may provide Additional Services after execution of this Agreement, without invalidating this Agreement if mutually agreed in writing, or if the Construction Manager's services are affected as described in § 4. In the absence of mutual agreement in writing, the Construction Manager shall promptly notify the Owner in writing prior to providing such services. If the Owner deems that all or a part of such Change in Services is not required, the Owner shall give prompt written notice to the Construction Manager, and the Construction Manager shall have no obligation to provide those services. Except for services required due to the fault of the Construction Manager, any Additional Services provided in accordance with this Section 4.2 shall entitle the Construction Manager to compensation pursuant to Section 11.3.

§ 4.2.2 If any of the following circumstances affect the Construction Manager's services for the Project, the Construction Manager shall notify the Owner in writing with reasonable promptness and explain the facts and

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circumstances giving rise to the need. The Construction Manager shall not proceed to provide the following Additional Services until the Construction Manager receives the Owner's written authorization:

.1 Services necessitated by a change in the Initial Information, previous instructions or approvals given by the Owner, or a material change in the Project including size, quality, complexity, the Owner's schedule or budget for Cost of the Work, or procurement or delivery method, or bid packages in addition to those listed in Section 1.1.6. Services necessitated by sections 6.4 and 6.6 shall not be considered additional services;

.2 Services necessitated by the enactment or revision of codes, laws, regulations or official interpretations after the date of this Agreement;

.3 Services necessitated by decisions of the Owner not rendered in a timely manner or any other failure of performance on the part of the Owner or the Owner's other consultants or contractors;

.4 Preparation of documentation for alternate bid or proposal requests proposed by the Owner;

.5 Preparation for, and attendance at, a public presentation, meeting or hearing;

.6 Preparation for, and attendance at, a dispute resolution proceeding or legal proceeding, except where the Construction Manager is party thereto or if such contains allegations relating to the services of the Construction Manager hereunder;

.7 Consultation concerning replacement of Work resulting from fire or other cause during construction and furnishing services required in connection with the replacement of such Work.

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Notwithstanding anything to the contrary contained herein, in no event shall Construction Manager be entitled to Additional Services if the need for such arises out or the failure of the Construction Manager to perform any of its services required hereunder or its negligence in doing so,

§ 4.2.3 Intentionally omitted.

§ 4.2.4 Except for services required under Section 3.3.30, Construction Phase Services provided more than 60 days after (1) the date of Substantial Completion of the Work, or (2) the anticipated date of Substantial Completion identified in the Initial Information, whichever is earlier, shall be compensated as Additional Services to the extent the Construction Manager incurs additional cost in providing those Construction Phase Services.

§ 4.2.5 If the services covered by this Agreement have not been completed within «Twenty Eight » («28 ») months of the date of this Agreement, through no fault of the Construction Manager, extension of the Construction Manager's services beyond that time shall be compensated as Additional Services.

ARTICLE 5 OWNER'S RESPONSIBILITIES

§ 5.1 Unless otherwise provided for under this Agreement, the Owner shall provide information in a timely manner regarding requirements for and limitations on the Project, including a written program, which shall set forth the Owner's objectives; schedule; constraints and criteria; special equipment; systems; and site requirements and Owner's aesthetic, functional and social goals.

§ 5.2 The Owner shall establish the Owner's budget for the Project, including (1) the budget for the Cost of the Work as defined in Section 6.1 based on consultation with the Construction Manager and Architect and, if required, their respective consultants. The Owner's budget for the Cost of the Work shall include a reasonable contingency. The Owner shall update the Owner's budget for the Project as necessary throughout the duration of the Project until final completion. If the Owner significantly increases or decreases the Owner's budget for the Cost of the Work, the Owner shall notify the Construction Manager and Architect. The Owner and the Architect, in consultation with the Construction Manager, shall thereafter agree to a corresponding change in the Project's scope and quality.

§ 5.3 Intentionally omitted.

§ 5.4 The Owner shall retain an Architect to provide services, duties and responsibilities as described in AIA Document B132–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition, as amended. The Owner shall provide the Construction Manager with a copy of the scope of services in the agreement executed between the Owner and Architect, and any further modifications to the Architect's scope of services in the agreement.

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§ 5.5 The Owner shall identify a representative authorized to act on the Owner's behalf with respect to the Project. The Owner shall render decisions pertaining to documents the Construction Manager submits in a timely manner in order to avoid unreasonable delay in the orderly and sequential progress of the Construction Manager's services.

§ 5.6 Unless provided by the Construction Manager, if reasonably required to plan and perform the Work, the Owner shall furnish surveys to describe physical characteristics, legal limitations and utility locations for the site of the Project, and a written legal description of the site. The surveys and legal information shall include, as applicable, grades and lines of streets, alleys, pavements and adjoining property and structures; designated wetlands; adjacent drainage; rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries, and contours of the site; locations, dimensions, and other necessary data with respect to existing buildings, other improvements and trees; and information concerning available utility services and lines, both public and private, above and below grade, including inverts and depths. All the information on the survey shall be referenced to a Project benchmark.

§ 5.7 Unless provided by the Construction Manager, if reasonably required to plan and perform the Work, the Owner shall furnish services of geotechnical engineers, which may include test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

§ 5.8 The Owner shall provide the Supplemental Services designated as the Owner's responsibility in Section 4.1.1.

§ 5.9 If the Owner identified a Sustainable Objective in Article 1, the Owner shall fulfill its responsibilities as required in AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, attached to this Agreement.

§ 5.10 The Owner shall procure and administer the contracts of its consultants; the Construction Manager shall coordinate the services of the Owner's consultants for the Project and those of the Architect with those services provided by the Construction Manager and its consultants. Upon the Construction Manager's request, the Owner shall furnish copies of the scope of services in the contracts between the Owner and the Owner's consultants. The Owner shall furnish the services of consultants other than those designated as the responsibility of the Construction Manager in this Agreement, or authorize the Construction Manager to furnish them as an Additional Service, when the Construction Manager requests such services and demonstrates that they are reasonably required by the scope of the Project. The Owner shall require that its consultants and contractors maintain insurance, including professional liability insurance, as appropriate to the services or work provided, and shall provide evidence of such insurance to the Owner.

§ 5.11 At the written request of the Construction Manager, the Owner shall furnish tests, inspections and reports required by law or the Contract Documents, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 5.12 The Owner shall furnish all legal, insurance and accounting services, including auditing services, that may be reasonably necessary at any time for the Project to meet the Owner's needs and interests.

§ 5.13 The Owner shall provide prompt written notice to the Construction Manager and Architect if the Owner observes any fault or defect in the Project, including errors, omissions or inconsistencies in the Architect's Instruments of Service or any fault or defect in the Construction Manager's services or non-conformance of any of the Work with the applicable Contract Documents, actually discovered by the Owner (the Owner having no duty to investigate the Work or Contract Documents and/or the Project, or to otherwise discover same).

§ 5.14 The Owner reserves the right to perform construction and operations related to the Project with the Owner's own forces, and to award contracts in connection with the Project which are not part of the Construction Manager's responsibilities under this Agreement. The Construction Manager shall notify the Owner if any such independent action will interfere with the Construction Manager's ability to perform the Construction Manager's responsibilities under this Agreement. When performing construction or operations related to the Project, the Owner agrees to be subject to the same obligations and to have the same rights as the Contractors.

§ 5.15 The Owner shall communicate with the Contractors and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and

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Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. Communications by and with the Architect's consultants shall be through the Architect.

§ 5.16 Before executing the Contracts for Construction, the Owner shall coordinate the Construction Manager's duties and responsibilities set forth in the Contracts for Construction with the Construction Manager's services set forth in this Agreement. The Owner shall provide the Construction Manager a copy of the executed agreements between the Owner and Contractors, including the General Conditions of the Contracts for Construction, as amended.

§ 5.17 The Owner shall provide the Construction Manager access to the Project site prior to commencement of the Work and shall obligate the Contractors to provide the Construction Manager access to the Work wherever it is in preparation or progress.

§ 5.18 Structural and Environmental Tests, Surveys and Reports.

§ 5.18.1 During the Preconstruction Phase, the Owner shall furnish the following information or services with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services. Except to the extent that the Construction Manager knows or should have known of any inaccuracy, the Construction Manager shall be entitled to rely on the accuracy of information and services furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 5.18.2 The Owner shall furnish tests, inspections and reports required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 5.18.3 To the extent requested in writing by the Construction Manager, the Owner shall furnish available surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Construction Manager shall check such surveys and if the Construction Manager notes any inaccuracies in such surveys with the observable physical conditions of the Property and the Contract Documents, it shall so notify the Owner and Architect.

§ 5.18.4 The Owner, when such services are requested and reasonably required and are not the responsibility of the Architect, shall furnish services of geotechnical engineers, which may include but are not limited to test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

§ 5.18.5 During the Construction Phase, 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 Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services.

ARTICLE 6 COST OF THE WORK

§ 6.1 For purposes of this Agreement, the Cost of the Work shall be the total cost to the Owner to construct all elements of the Project designed or specified by the Architect and shall include the Contractors' general conditions costs, overhead and profit. The Cost of the Work also includes the reasonable value of labor, materials, and equipment, donated to, or otherwise furnished by, the Owner. The Cost of the Work includes the compensation of the Construction Manager and Construction Manager's Consultants during the Construction Phase only, including compensation for reimbursable expenses at the job site, if any. The Cost of the Work does not include the compensation of the Architect; the costs of the land, rights-of-way, financing, or contingencies for changes in the Work; or other costs that are the responsibility of the Owner.

§ 6.2 The Owner's Project Budget , and shall be adjusted throughout the Project as required under Sections 5.2 and 6.4. Evaluations of the Owner's budget for the Cost of the Work, and the estimates of the Cost of the Work prepared by the Construction Manager, represent the Construction Manager's judgment as a person or entity familiar with the construction industry. It is recognized, however, that neither the Construction Manager nor the Owner has control over

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the cost of labor, materials; or equipment; the Contractors' methods of determining bid prices; or competitive bidding, market, or negotiating conditions. Accordingly, the Construction Manager cannot and does not warrant or represent that bids or negotiated prices will not vary from the Owner's budget for the Cost of the Work, or from any estimate of the Cost of the Work, or evaluation, prepared or agreed to by the Construction Manager.

§ 6.3 If the Architect is providing cost estimating services as a Basic Service, and a discrepancy exists between the Construction Manager's cost estimates and the Architect's cost estimates, the Construction Manager and the Architect shall work together to reconcile the cost estimates.

§ 6.4 If the Construction Manager's estimate of the Cost of the Work exceeds the Owner's Project Budget for the Cost of the Work, the Construction Manager, as a part of Basic Services and without additional compensation, shall in consultation with the Architect, make appropriate recommendations to the Owner for such modifications to materials and/or the deletion of components as are required to effect cost reductions (which modifications and deletions shall, however, be subject to Owner's written approval) and shall cooperate with the Architect in revising the Drawings and Specifications to bring the estimated Cost of the Work to equal or be less than the Project Budget for the Cost of the Work.

§ 6.5 Intentionally omitted.

§ 6.6 If the Owner chooses to revise the Project program, scope, or quality to reduce the Cost of the Work pursuant to Section 6.5.3, or if the bids or proposals received from the prospective Contractors, in the aggregate, exceed the Owner's budget for the Cost of the Work, and the Owner chooses to revise the Project program, scope, or quality to reduce the Cost of the Work , the Construction Manager shall cooperate with the Owner and Architect to develop the necessary revisions, update the cost estimate, and obtain additional bids. The Construction Manager will perform the services described in Sections 6.4 and 6.6 without additional compensation.

ARTICLE 7 COPYRIGHTS AND LICENSES

The Construction Manager and the Construction Manager's consultants, if any, shall not own or claim a copyright in the Instruments of Service. The Construction Manager, the Construction Manager's consultants, if any, and the Owner warrant that in transmitting Instruments of Service, or any other information, the transmitting party is the copyright owner of such information or has permission from the copyright owner to transmit such information for its use on the Project.

ARTICLE 8 CLAIMS AND DISPUTES

§ 8.1 General

§ 8.1.1 The Owner and Construction Manager shall commence all claims and causes of action against the other and arising out of or related to this Agreement, whether in contract, tort, or otherwise, in accordance with the requirements of the binding dispute resolution method selected in this Agreement and within the period specified by applicable law,. The Owner and Construction Manager waive all claims and causes of action not commenced in accordance with this Section 8.1.1.

§ 8.1.2 To the extent damages are covered by property insurance, the Owner and Construction Manager waive all rights against each other and against the contractors, consultants, agents, and employees of the other for damages, except such rights as they may have to the proceeds of such insurance as set forth in AIA Document A232–2019, General Conditions of the Contract for Construction, as amended. The Owner and the Construction Manager each shall require similar waivers from their respective contractors, subcontractors, consultants, agents and persons or entities awarded separate contracts administered under the Owner's and Construction Manager's own forces, and shall obtain consent, if necessary, from the appropriate insurers. This waiver afforded the Construction Manager and its contractors, consultants, agents, and employees shall apply only as to property damage covered under the terms of property insurance policies actually in force and shall in no event apply to damages or injuries caused by the errors and omissions of the Construction Manager or its contractors, consultants, agents and employees .

§ 8.1.3 The Construction Manager shall indemnify and hold the Owner and the Owner's officers, representatives and employees(collectively "Owner Indemnitees") harmless from and against damages, losses and judgments arising from claims by third parties, including reasonable attorneys' fees and expenses (including any attorneys' fees or expenses incurred in connection with this indemnification and the enforcement thereof)recoverable under applicable law, but only to the extent they are arising out of, or resulting from the negligent acts or omissions of the Construction Manager, its subcontractors, agents, employees and its consultants or any other person or entity for whose acts they may be liable in

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relation to the Project. Such obligation shall not be construed to negate, abridge or otherwise reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this paragraph. The Architect shall also indemnify and hold harmless the Owner Indemnitees from any and all costs, fees and expenses incurred by any and all of them in connection with establishing any of the Owner Indemnitees' right to indemnification under this Agreement. In respect o any and all claims by an employee of the Architect, or anyone directly or indirectly employed by the Architect, or anyone for whose acts the Architect may be liable, against any Owner Indemnitees hereunder, the indemnification obligation under this Section 8.1.3 shall not be limited in any way by any limitation on the amount or type of damages or by the compensation or benefits payable by or for the Architect under workers'' compensation acts, disability benefit acts, or other employee benefit acts. The Construction Manager's obligation to indemnify and hold the Owner and the Owner's officers and employees harmless does not include a duty to defend. These indemnity obligations shall survive termination of this Agreement and completion of Architect's services for the Project.

§ 8.2 Mediation

§ 8.2.1 Any claim, dispute or other matter in question arising out of or related to this Agreement shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 8.2.2 The Owner and Construction Manager shall endeavor to resolve claims, disputes and other matters in question between them by mediation, which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of this Agreement. A request for mediation shall be made in writing, delivered to the other party to this Agreement, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of a complaint or other appropriate demand for binding dispute resolution.

§ 8.2.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 8.2.4 If the parties do not resolve a dispute through mediation pursuant to this Section 8.2, the method of binding dispute resolution shall be the following:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 8.3 of this Agreement

[« »] Litigation in the Court of Common Pleas of Montgomery County which shall have exclusive jurisdiction and venue

[« »] Other: *(Specify)*

« »

§ 8.3 Intentionally Omitted

§ 8.4 The provisions of this Article 8 shall survive the termination of this Agreement.

ARTICLE 9 TERMINATION OR SUSPENSION

§ 9.1 If the Owner fails to make payments to the Construction Manager in accordance with this Agreement, the Construction Manager may, upon twenty-one days' written notice to the Owner, suspend performance of services under this Agreement. Unless payment in full of all amounts properly due the Construction Manager is received by the Construction Manager within twenty-one days of the day of notice, the suspension shall take effect without further notice. In the event of a suspension of services, the Construction Manager shall have no liability to the Owner for delay or damage caused the Owner because of such suspension of services.

§ 9.2 If the Owner suspends the Project through no fault of the Construction Manager, the Construction Manager shall be compensated for any services performed prior to notice of such suspension.

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§ 9.3 Intentionally omitted. If the Owner suspends the Project for more than 90 cumulative days for reasons other than the fault of the Construction Manager, the Construction Manager may terminate this Agreement by giving not less than seven days' written notice.

§ 9.4 Either party may terminate this Agreement upon not less than twenty-one days' written notice should the other party fail substantially to perform in accordance with the material terms of this Agreement through no fault of the party initiating the termination and fails to cure such non-performance within such twenty-one day period after written notice of the non-performance.

§ 9.5 The Owner may terminate this Agreement upon not less than seven days' written notice to the Construction Manager for the Owner's convenience and without cause.

§ 9.6 In the event this Agreement is terminated without cause, the Construction Manager, as its sole and exclusive remedy hereunder, shall be entitled to receive compensation due for the portion of the services performed prior to such termination and for any Reimbursable Expenses properly incurred to date and substantiated in in accordance with § 11.6. Under no circumstances shall Construction Manager be compensated for loss of anticipated profits associated with the unfinished portion of the Project. The sum total of payments under this § 9.6 shall not exceed the total contract sum, less payments previously made.

§ 9.7 Intentionally omitted.
« »

§ 9.8 Except as otherwise expressly provided herein, this Agreement shall terminate one year from the date of Final Completion.

§ 9.9 Suspension The Work may be suspended by the Owner as provided in Article 14 of the General Conditions.

ARTICLE 10 MISCELLANEOUS PROVISIONS

§ 10.1 This Agreement shall be governed by laws of the Commonwealth of Pennsylvania without application of its choice of law provisions.

§ 10.2 Terms in this Agreement shall have the same meaning as those in AIA Document A232–2019, General Conditions of the Contract for Construction, as amended, except for purposes of this Agreement, the term "Work" shall include the work of all Contractors under the administration of the Construction Manager and the Architect.

§ 10.3 The Owner and Construction Manager, respectively, bind themselves, their partners, their agents, successors, assigns, and legal representatives to the other party to this Agreement and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants of this Agreement.

§ 10.4 Intentionally omitted.

§ 10.5 Nothing contained in this Agreement shall create a contractual relationship with, or a cause of action in favor of, a third party against either the Owner.

§ 10.6 Unless otherwise required in this Agreement, the Construction Manager shall have no responsibility for the discovery, presence, handling, removal or disposal of, or exposure of persons to, hazardous materials or toxic substances in any form at the Project site.

§ 10.7 Upon the Owner's prior written consent, the Construction Manager may include photographic or artistic representations of the design of the Project among the Construction Manager's promotional and professional materials. The Construction Manager's materials shall not include the Owner's confidential or proprietary information if the Owner has previously advised the Construction Manager in writing of the specific information considered by the Owner to be confidential or proprietary. This Section 10.7 shall survive the termination of this Agreement unless the Owner terminates this Agreement for cause pursuant to Section 9.4.

§ 10.8 Except a may be required by applicable law or court order, if the Construction Manager or Owner receives information specifically designated as "confidential" or "business proprietary," the receiving party shall keep such

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information strictly confidential and shall not disclose it to any other person except as set forth in Section 10.8.1. This Section 10.8 shall survive the termination of this Agreement.

§ 10.8.1 The receiving party may disclose "confidential" or "business proprietary" information after 7 days' notice to the other party, when required by law, arbitrator's order, or court order, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or to the extent such information is reasonably necessary for the receiving party to defend itself in any dispute. The receiving party may also disclose such information to its employees, consultants, or contractors in order to perform services or work solely and exclusively for the Project, provided those employees, consultants and contractors are subject to the restrictions on the disclosure and use of such information as set forth in this Section 10.8.

§ 10.9 The invalidity of any provision of the Agreement shall not invalidate the Agreement or its remaining provisions. If it is determined that any provision of the Agreement 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 Agreement shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Agreement.

ARTICLE 11 COMPENSATION

§ 11.1 For the Construction Manager's Basic Services described under Article 3, the Owner shall compensate the Construction Manager as follows:

§ 11.1.1 For Preconstruction Phase Services in Section 3.2:
(Insert amount of, or basis for, compensation, including stipulated sums, multiples or percentages.)

«See below »

§ 11.1.2 For Construction Phase Services in Section 3.3:
(Insert amount of, or basis for, compensation, including stipulated sums, multiples or percentages.)

«

§ 11.2 For the Construction Manager's Supplemental Services designated in Section 4.1.1, and for any Sustainability Services required pursuant to Section 4.1.3, the Owner shall compensate the Construction Manager as follows:
(Insert amount of, or basis for, compensation. If necessary, list specific services to which particular methods of compensation apply.)

« »

§ 11.3 For Additional Services that may arise during the course of the Project, including those under Section 4.2, the Owner shall compensate the Construction Manager as follows:
(Insert amount of, or basis for, compensation.)

« »

§ 11.4 Compensation for Supplemental and Additional Services of the Construction Manager's consultants when not included in Sections 11.2 or 11.3, shall be the amount invoiced to the Construction Manager without mark-up:
(Insert amount of, or basis for computing, Construction Manager's consultants' compensation for Supplemental or Additional Services.)

« »

§ 11.5 The hourly billing rates for services of the Construction Manager and the Construction Manager's consultants are set forth below. The rates shall be adjusted in accordance with the Construction Manager's and Construction Manager's consultants' normal review practices.
(If applicable, attach an exhibit of hourly billing rates or insert them below.)

«Hourly rates set forth in Exhibit A »

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Employee or Category	Rate ($0.00)

§ 11.6 Compensation for Reimbursable Expenses

§ 11.6.1 Reimbursable Expenses are in addition to compensation for Basic, Supplemental, and Additional Services and include expenses incurred by the Construction Manager and the Construction Manager's consultants directly related to the Project, as follows:

.1 Expense of authorized long-distance transportation in connection with the Project and authorized out-of-state travel and subsistence;

.2 Expenses paid to third party providers for authorized dedicated data and communication services, teleconferences, Project web sites, and extranets;

.3 Permitting and other fees required by authorities having jurisdiction over the Project;

.4 Actual expense of reproductions, courier service, overnight mail, transmissions of Drawings Specifications and other documents;

.5 Intentionally omitted;

.6 Expense of overtime work requiring higher than regular rates, if authorized in advance in writing by the Owner;

.7 Professional photography, and presentation materials requested in writing by the Owner;

.8 If required by the Owner, and with the Owner's prior written approval, the Construction Manager's consultants' expenses of professional liability insurance dedicated exclusively to this Project;

.9 All taxes levied and paid by Construction Manager on professional services for this Project and on reimbursable expenses.

§ 11.6.2 For Reimbursable Expenses the compensation shall be the third party expenses actually incurred by the Construction Manager and the Construction Manager's consultants without mark-up.

§ 11.7Intentionally omitted.

§ 11.8 Payments to the Construction Manager

§ 11.8.1 Initial Payment

§ 11.8.1.1 No initial payment shall be made upon execution of this Agreement.

§ 11.8.2 Progress Payments

§ 11.8.2.1 Unless otherwise agreed, payments for services shall be made monthly in proportion to services performed. Payments are due and payable upon presentation of the Construction Manager's invoice. The Construction Manager shall not be entitled to receive any interest on payments that are not made in accordance with the time periods set forth herein, irrespective of the reason therefor, including, without limitation, in the event that such payment is not made on a timely basis due to the fault of the Owner

(Insert rate of monthly or annual interest agreed upon.)

« » % « »

§ 11.8.2.2 Provided that the Owner has received the Construction Manager's invoice by not later that the fifth day of the month, the Owner shall make payment to the Construction Manager of any sums due not later than the fifth of the following month. If the Construction Manager's invoice is received by the Owner after the date fixed above, payment shall be made by the Owner not later than the fifth day of the second month after the Owner receives the Construction Manager's invoice. However, Owner may withhold payment to Construction Manager for a default of Construction Manager in performing a material obligation of Construction Manager under this Agreement and Construction Manager's failure promptly to cure such default after written notice thereof from Owner to Construction Manager The

§ 11.8.2.3 Records of Reimbursable Expenses, expenses pertaining to Supplemental and Additional Services, and services performed on the basis of hourly rates shall be available to the Owner at mutually convenient times.

§ 11.9 Non-Appropriation of Funds

§ 11.9.1 The Owner's obligation to make payments during any fiscal year succeeding the current fiscal year shall be subject to the availability and appropriation of funds. When funds (state, local and/or federal) are not appropriated or

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otherwise made available to support continuation of the performance of the Project or any portion or phase thereof in a subsequent fiscal year period, the Owner shall have the right to terminate this Agreement. The Construction Manager shall be reimbursed for the reasonable value of any nonrecurring costs incurred, but not amortized, for the supplies or services delivered under this Agreement prior to such termination. Such reimbursement shall not include loss of profit, loss of use of money, or administrative or overhead costs. The reimbursement amount may be paid for any appropriations available for that purpose.

ARTICLE 12 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Agreement are as follows:
(Include other terms and conditions applicable to this Agreement.)

«§ 12.1 Severability

The provisions of this Agreement and the Contract Documents shall be deemed severable and the invalidity or unenforceability of any provision shall not affect the validity and enforceability of the other provisions hereof. If any provision of this Agreement, or other Contract Document, is unenforceable for any reason whatsoever, that provision shall be appropriately limited and given effect to the extent that may be enforceable, and if such provision cannot be so limited, such provision shall be deemed severed from this Agreement or another Contract Document, as applicable, and each other provision of the applicable documents shall be valid and enforceable to the greatest extent permitted by law.

§ 12.2 Notices

All notices or submittals required or permitted pursuant to this Agreement shall be in writing, shall be personally delivered or sent by certified or registered mail, return receipt requested, or by a nationally recognized overnight delivery service, and shall be deemed given when received.

§ 12.3 By executing this Agreement as well as each modification to this Agreement, the Construction Manager certifies to the Owner as follows:

.1 The prices contained in this Agreement, as well as in each modification to this Agreement, has been arrived at independently without collusion, consultation, communication or agreement for the purpose of restricting competition as to any matter relating to prices with any other bidder for the Project or with any competitor of the Construction Manager;

.2 The prices which are contained in this Agreement, as well as in each modification to this Agreement, have not been knowingly disclosed prior to bid opening to any other bidder or competitor; and

.3 No attempt has been made by the Construction Manager to induce any other person, partnership, corporation or other entity to submit or not to submit a bid in connection with this Project.

§ 12.4 In performing its obligations under this Agreement, the Construction Manager shall be deemed an independent contractor and not an agent or employee of the Owner.

§ 12.5 Any indemnity or other obligation or responsibility assumed by the Construction Manager to Owner under the Contract Documents shall survive the expiration or termination of this Agreement and shall be binding upon the Construction Manager until any action thereunder is barred by the applicable statute of limitations, subject to any applicable provision of the Pennsylvania Statute of Repose.

§ 12.6 The Construction Manager agrees that throughout the course of construction of the Work, the Construction Manager will continue to develop "value engineering" alternatives to the Work, and shall promptly report to the Owner the result of such "value engineering".

§ 12.7 The parties waive the effect of any statutory or common law provision which construes ambiguities in a contract against the party that drafted the contract.

§ 12.8 Representations and Warranties of Construction Manager

§ 12.8.1 The Construction Manager represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute this

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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 That it is financially solvent, able to pay all of its debts as they mature and possessed of sufficient working capital to complete the Work and perform all obligations hereunder.

.2 That it is authorized to do business in the city and state in which the Project will be built and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the Property.

.3 That the execution of this Agreement and its performance thereof is within its duly authorized powers.

.4 That it is duly authorized to perform this Agreement and has correlated his or her observations with the requirements of the Contract Documents.

.5 That no subsidiary or affiliate of the Construction Manager provides any services or supplies in connection with the Work. The Construction Manager will notify the Owner promptly in the event that any subsidiary or affiliate of the Construction Manager provides services or supplies in connection with the Work.

§ 12.9 Advertising

No advertising will be permitted within the Work area or adjacent area. This does not apply to corporate vehicles or attire.

§ 12.10 Tax Liability and Offset

§ 12.10.1 The Construction Manager, by execution of this Agreement, certifies that it has no outstanding tax liability to the Commonwealth of Pennsylvania or the Owner; authorizes the Department of Revenue to release information related to its tax liability to the Owner; and authorizes the Owner to set off any State and local tax liabilities of the Construction Manager or any of its subsidiaries, as well as any other amount(s) due to the Owner from the Construction Manager that are not being contested on appeal by the Construction Manager, against any payment due to the Construction Manager under an agreement with the Owner.

§ 12.10.2 The foregoing certification of no outstanding tax liability is a material representation of fact upon which reliance is placed by the Owner in entering this Agreement. If it is later determined that the Construction Manager knowingly rendered an erroneous or inaccurate certification, the Owner may find the Construction Manager in default and terminate this Agreement. Such erroneous or inaccurate certification may also be grounds for initiation of civil or criminal proceedings.

§ 12.11 Debarment or Suspension

The Owner shall recommend debarment or suspension action against the Construction Manager whenever there is substantial evidence that there exists a cause for debarment or suspension.

§ 12.12 Construction Manager's Additional Responsibilities

§ 12. 12.1 The Construction Manager certifies, in writing, for itself, its subcontractors and consultants required to be disclosed or approved by the Owner, that as of the date of its execution of this Agreement, that neither the Construction Manager, nor any such subcontractors or consultants, are under suspension or debarment by the Commonwealth of Pennsylvania, Owner or any other governmental entity, instrumentality, or authority and, if the Construction Manager cannot so certify, then it agrees to submit a written explanation of why such certification cannot be made.

§ 12.12.2 The Construction Manager also certifies, in writing, that as of the date of its execution of this Bid/Contract it has no tax liabilities or other County of Montgomery, PA obligations, or has filed a timely administrative or judicial appeal if such liabilities or obligations exist, or is subject to a duly approved deferred payment plan if such liabilities exist. If the Construction Manager cannot so certify because of the scope and nature of its organizational structure, then it agrees to make such certification to the best extent possible and to submit, along with its Bid/Contract, a written explanation of why such certification cannot be made in full.

§ 12.12.3 The Construction Manager's obligations pursuant to these provisions are continuing from and after the effective date of this Agreement through the termination date thereof. Accordingly, the Construction Manager shall

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have an obligation to inform the Owner if, at any time during the term of this Agreement, it becomes delinquent in the payment of taxes, or other County obligations, or if it or any of its subcontractors or consultants are suspended or debarred by the Commonwealth of Pennsylvania, Owner, the federal government, or any other state or governmental entity. Such notification shall be made within 15 days of the date of suspension or debarment. To the extent the size or nature of the Construction Manager prevents it from carrying out this obligation in full, it shall provide written documentation explaining why this obligation cannot be fully complied with, and shall have a continuing obligation to report to the greatest extent possible.

§ 12.12.4 The failure of the Construction Manager to notify the Owner of its suspension or debarment by the Commonwealth of Pennsylvania, Owner, any other state, any other county or the federal government shall constitute an event of default of this Agreement.

§ 12.12.5 The Construction Manager agrees to reimburse the Owner for the reasonable costs of investigation incurred by any investigative office of the Owner for investigations of the Construction Manager's compliance with the terms of this or any other agreement between the Construction Manager and the Owner that results in the suspension or debarment of the Construction Manager. Such costs shall include, but shall not be limited to, salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The Construction Manager shall not be responsible for investigative costs for investigations that do not result in the Construction Manager's suspension or debarment.

§ 12.13. Nondiscrimination/Sexual Harassment

§ 12.12.1 In the hiring of any employee(s) for the manufacture of supplies, performance of work or services, or any other activity required under the Agreement or any subcontract, the Construction Manager, each subcontractor or consultant, or any person acting on behalf of the Construction Manager or subcontractor or consultant shall not, by reason of gender, race, creed, or color, discriminate against any citizen of this Owner or the Commonwealth of Pennsylvania who is qualified and available to perform the work to which the employment relates.

§ 12.13.2 Neither the Construction Manager nor any subcontractor nor any person on their behalf shall in any manner discriminate against or intimidate any employee involved in the manufacture of supplies, the performance of work, or any other activity required under the contract on account of gender, race, creed, or color.

§ 12.13.3 The Construction Manager and each of its subcontractors or consultants shall establish and maintain a written sexual harassment policy and shall inform their employees of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined.

§ 12.13.4 The Construction Manager and each subcontractor shall not discriminate by reason of gender, race, creed, or color against any subcontractor or supplier who is qualified to perform the work to which the contract relates.

§ 12.13.5 The Construction Manager shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subcontract so that those provisions applicable to all subcontractors and consultants will be binding upon each subcontractor or consultant. If the Construction Manager cannot fully comply with this subsection due to the nature or scope of its organization, it must use best efforts to do so and provide a written explanation as to why it is unable to fully comply.

§ 12.13.6 The Owner may cancel or terminate this Agreement and all money due or to become due thereunder may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the agency may proceed with debarment or suspension and may place the Construction Manager in the Contractor Responsibility File.

§ 12.14 Covenant Against Contingent Fees

The Construction Manager warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage, brokerage or contingent fee (excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Construction Manager for the purpose of securing business). For breach or violation of this warranty, the Owner shall have the right to annul this Agreement without liability or, in its discretion, to deduct from the Construction Manager's compensation hereunder, or otherwise recover, the full amount of such commission, percentage, or contingent fee.

§ 12.15 Americans with Disabilities Act

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Pursuant to federal regulations promulgated under the authority of the Americans with Disabilities Act (28 C.F.R. 35.101 et seq.), no individual with a disability shall, on the basis of the disability, be excluded from participation in this Agreement or from activities provided for under this Agreement. As a condition of accepting and executing this Agreement, the Construction Manager 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 the benefits, services, programs, and activities provided by the Owner through contracts with outside contractors. The Construction Manager shall be responsible for and agrees to indemnify and hold harmless the Owner from all losses, damages, expenses, claims, demands, suits, and actions brought by any party against the Owner as a result of the Construction Manager's failure to comply with the provisions of this section.

§ 12.16 Right to Know Law

§ 12.16.1 Unless otherwise determined by a Pennsylvania appellate court subsequent to the execution of this Agreement, the Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104 ("RTKL"), applies to this Agreement. Unless the Construction Manager provides the Owner, in writing, with the name and contact information of another person who will act on behalf of the Construction Manager regarding the RTKL, the Owner shall notify the Construction Manager if the Owner needs the Construction Manager's assistance in connection with a request made under the RTKL. The Construction Manager shall notify the Owner in writing of any change in the name or the contact information within a reasonable time prior to the change.

§ 12.16.2 Upon notification to the Construction Manager that the Owner has received a request for the Construction Manager's records under the RTKL (the "Requested Information"), the Construction Manager agrees to assist the Owner in responding to the request. Such assistance shall include providing the Owner, within three (3) days, with copies of any Requested Information in the Construction Manager's possession that the Construction Manager deems a Public Record, as that term is defined in the RTKL, or otherwise notify the Owner that the Requested Information is not a Public Record. If the Construction Manager is unable to provide the Requested Information within three (3) days for one of the reasons specified in the RTKL, the Construction Manager agrees to timely notify the Owner that it will need up to an additional twenty-five (25) days, and must provide in writing the reason the additional time is needed. If the Construction Manager makes a determination the Requested Information is within the scope of the RTKL but fails to provide the Requested Information to the Owner within the period specified in this provision, the failure shall be considered an event of default and the Construction Manager shall pay, indemnify, and hold the Owner harmless for any damages, penalties, detriment, or harm that the Owner may incur as a result of the Construction Manager's failure.

§ 12.16.3 The Construction Manager's determination as to whether the Requested Information is a Public Record is dispositive of the question as between the parties. The Construction Manager agrees to provide information and/or to appear before the Office of Open Records or Pennsylvania Courts in support of the Owner's denial of access to a record the Construction Manager determined was not a Public Record. The Construction Manager agrees to indemnify the Owner for any court costs, attorneys' fees, or civil penalties awarded against the Owner under the RTKL in connection with or as a result of the Construction Manager's denial of access to Requested Information.

§ 12.16.4 If in the course of this Agreement, the Owner is provided with information the Construction Manager clearly identifies as a Trade Secret or Confidential Proprietary Information, as those terms are defined by the RTKL, the Owner agrees to abide by the terms of Section 707 of the RTKL and timely provide the Construction Manager with notice of a request for this information and allow the Construction Manager the ability to respond, as provided by the RTKL. The Construction Manager reserves all rights and remedies as allowed by law relating to the Owner's unauthorized disclosure of the Construction Manager's Trade Secret or Confidential Proprietary Information. This provision shall not be construed to limit the sovereign immunity of the Owner.

§ 12.16.5 The Owner will reimburse the Construction Manager for any costs associated with complying with this provision only to the extent allowed under the applicable fee schedule established by the Office of Open Records or as otherwise provided by the RTKL if the fee schedule is inapplicable.

§ 12.16.6 The Construction Manager agrees to abide by any decision to release a record to the public made by the Office of Open Records after timely appeal to the Pennsylvania Courts.

»

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User Notes: (1733184361)

ARTICLE 13 SCOPE OF THE AGREEMENT

§ 13.1 This Agreement represents the entire and integrated agreement between the Owner and the Construction Manager and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both the Owner and Construction Manager.

§ 13.2 This Agreement is comprised of the following documents identified below:

.1 AIA Document C132™–2019, Standard Form Agreement Between Owner and Construction Manager as Adviser, as amended

.2 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.)

« »

.3 Exhibits:
(Check the appropriate box for any exhibits incorporated into this Agreement.)

[« »] 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.)

« »

[« »] Other Exhibits incorporated into this Agreement:
(Clearly identify any other exhibits incorporated into this Agreement, including any exhibits identified in Section 4.1.2.)

« »

.4 Other documents:
(List other documents, if any, forming part of the Agreement.)

«Exhibit A, Hourly Rates of the Construction Manager and its Consultants
RFP 23-14 CMa »

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

COUNTY OF MONTGOMERY	CONSTRUCTION COMPANY NAME
OWNER *(Signature)*	**CONSTRUCTION MANAGER** *(Signature)*
«Lee Solysiak, Chief Operating Officer »« »	« »« »
(Printed name and title)	*(Printed name and title)*
OWNER *(Signature)*	**CONSTRUCTION MANAGER WITNESS** *(Signature)*
Kenneth Lawrence Chairman, Montgomery County Commissioners	
(Printed name and title)	

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OWNER *(Signature)*

David Hahn, Capital Projects Director

(Printed name and title)

DRAFT

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User Notes: (1733184361)

SEE ADD. #1

PROJECT MANUAL

Montgomery County
New Live Fire Training Building
Public Safety Training Center, Plymouth Township

1175 Conshohocken Road
Conshohocken, Pennsylvania 19428

100% Construction Documents
May 21, 2026

PREPARED FOR:
Montgomery County
P.O. BOX 311
NORRISTOWN, PENNSYLVANIA 19404

PREPARED BY:
MW Studios
8098 SANDPIPER CIRCLE, SUITE H
NOTTINGHAM, MARYLAND 21236
23-209

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SECTION 00 0010 - TABLE OF CONTENTS

MONTGOMERY COUNTY ISSUED PROCUREMENT AND CONTRACTING DOCUMENTS

THESE DOCUMENTS MAY INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:

Instructions to Bidders
General Contractor; GC-01 - Bid Form
Plumbing Contractor; PC-22 - Bid Form
Electrical Contractor; EC-26 - Bid Form
AIA132 - 2019 - Owner-Contractor CMa
AIA132 - Exhibit A - 2019 - Insurance and Bonds
AIA232 - 2019 General Conditions CMa
A310 - Bid Bond
A312 - Payment Bond
A312 - Performance Bond
AIA A304 - Exhibit A
AIA A305 - Exhibit B
Exhibit A - Montgomery County Participation Goals
Non-Collusion Affidavit
Responsible Contractor Ordinance
Prevailing Minimum Wage Determinations
Electronic Release Form
Bid Schedule

WHERE REQUIREMENTS WITHIN THE TECHNICAL SPECIFICATION INDICATE A CONFLICTING OR LESS RESTRICTIVE REQUIREMENT THAN STATED WITHIN ANY MONTGOMERY COUNTY ISSUED PROCUREMENT OR CONTRACTING DOCUMENTS THE MONTGOMERY COUNTY ISSUED PROCUREMENT AND CONTRACTING DOCUMENT(S) SHALL TAKE PRECEDENCE.

TECHNICAL SPECIFICATIONS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

00 0010 - Table of Contents

00 0101 - Project Identification Page

00 0103 - Project Directory

00 0115 - List of Drawing Sheets

00 2600 - Procurement Substitution Procedures

00 3100 - Available Project Information

00 3101 - Public Safety Training Campus Survey
00 3102 - Geotechnical Report

DIVISION 01 -- GENERAL REQUIREMENTS
01 0600 - Mobilization/Demobilization
01 1000 - Summary
01 1010 - Multiple Contract Reference and Description Summary
01 2000 - Price and Payment Procedures
01 2100 - Allowances
01 2200 - Unit Prices
01 2300 - Alternates
01 2500 - Substitution Procedures
01 2501 - Substitution Request Form
01 3000 - Administrative Requirements
01 3001 - Submittal Review and Transmittal
01 3216 - Construction Progress Schedule
01 4000 - Quality Requirements
01 4216 - Definitions
01 4219 - Reference Standards
01 5000 - Temporary Facilities and Controls
01 5213 - Field Offices and Sheds
01 6000 - Product Requirements
01 7000 - Execution and Closeout Requirements
01 7123 - Field Engineering
01 7419 - Construction Waste Management and Disposal
01 7800 - Closeout Submittals
01 7801 - Operation and Maintenance Manual Template
01 7900 - Demonstration and Training

DIVISION 02 -- EXISTING CONDITIONS (NOT USED)

DIVISION 03 -- CONCRETE

03 3000 - Cast-in-Place Concrete

03 3001 - Cast-in-Place Concrete - Site Work

DIVISION 04 -- MASONRY

04 0511 - Masonry Mortaring and Grouting

04 2000 - Unit Masonry

DIVISION 05 -- METALS

05 1200 - Structural Steel Framing

05 3100 - Steel Deck

05 5000 - Metal Fabrications

05 5119 - Metal Grating Stairs

05 5213 - Pipe and Tube Railings

05 5313 - Bar Gratings

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

06 1053 - Miscellaneous Rough Carpentry

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 1113 - Bituminous Dampproofing

07 1800 - Traffic Coatings

07 1900 - Water Repellents

07 4113.16 - Standing-Seam Metal Roof Panels

07 7000 - Thermal Lining Systems

07 9200 - Joint Sealants

07 9205 - Paving Joint Sealants

DIVISION 08 -- OPENINGS

08 1113 - Hollow Metal Doors and Frames

08 3100 - Access Doors and Panels

08 7100 - Door Hardware

08 9000 - Louvers And Vents

DIVISION 09 -- FINISHES

09 9600 - High-Performance Coatings

DIVISION 10 -- SPECIALTIES

10 1100 - Visual Display Units

10 1419 - Dimensional Letter Signage

10 5613 - Metal Storage Shelving

DIVISION 11 -- EQUIPMENT

11 6733 - Structural Fire Trainer Systems and Equipment

DIVISION 12 -- FURNISHINGS (NOT USED)

DIVISION 13 -- SPECIAL CONSTRUCTION

13 0010 - Special Construction - Site Work

13 3419 - Metal Building Systems

DIVISION 14 -- CONVEYING EQUIPMENT (NOT USED)

DIVISION 15 -- RESERVED (NOT USED) (FOR MECHANICAL, SEE DIVISIONS 21, 22, AND 23)

DIVISION 16 -- RESERVED (NOT USED) (FOR ELECTRICAL, SEE DIVISIONS 25, 26, 27, 28, AND 29)

DIVISION 17 -- RESERVED (NOT USED)

DIVISION 18 -- RESERVED (NOT USED)

DIVISION 19 -- RESERVED (NOT USED)

DIVISION 20 -- RESERVED (NOT USED)

DIVISION 21 -- FIRE SUPPRESSION

21 1300 - Fire-Suppression Sprinkler Systems

DIVISION 22 -- PLUMBING

22 0500 - Common Work Results for Plumbing

22 0553 - Identification for Plumbing Piping and Equipment

22 1113 - Facility Water Distribution Piping
22 1116 - Domestic Water Piping

DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
23 1126 - Facility Liquefied-Petroleum Gas Piping

DIVISION 24 -- RESERVED (NOT USED)

DIVISION 25 -- INTEGRATED AUTOMATION (NOT USED)

DIVISION 26 -- ELECTRICAL
26 0519 - Low-Voltage Electrical Power Conductors and Cables
26 0526 - Grounding and Bonding for Electrical Systems
26 0529 - Hangers and Supports for Electrical Systems
26 0533.13 - Conduit for Electrical Systems
26 0533.16 - Boxes for Electrical Systems
26 0548 - Vibration and Seismic Controls for Electrical Systems
26 0553 - Identification for Electrical Systems
26 0583 - Wiring Connections
26 2200 - Low-Voltage Transformers
26 2416 - Panelboards
26 2726 - Wiring Devices
26 2813 - Fuses
26 5100 - Interior Lighting
26 5600 - Exterior Lighting

DIVISION 27 -- COMMUNICATIONS (NOT USED)

DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY (NOT USED)

DIVISION 29 -- RESERVED (NOT USED)

DIVISION 30 -- RESERVED (NOT USED)

DIVISION 31 -- EARTHWORK
31 0000 - Earthwork

31 0141 - Dust Control
31 1000 - Site Clearing
31 2316.13 - Trenching
31 2500 - Soil Erosion and Sediment Control

DIVISION 32 -- EXTERIOR IMPROVEMENTS
32 1216 - Asphalt Paving
32 1313 - Concrete Paving
32 1373 - Concrete Paving Joint Sealants
32 1713 - Parking Bumpers
32 1723 - Pavement Markings
32 3113 - Chain Link Fences and Gates
32 3300 - Site Furnishings
32 9200 - Turf and Grasses
32 9300 - Plants

DIVISION 33 -- UTILITIES
33 0110.58 - Disinfection of Water Utility Piping Systems
33 0505.31 - Hydrostatic Testing
33 0561 - Concrete Manholes
33 1416 - Site Water Utility Distribution Piping
33 4100 - Storm Utility Drainage Piping

DIVISION 34 -- TRANSPORTATION (NOT USED)

DIVISION 35 -- WATERWAY AND MARINE CONSTRUCTION (NOT USED)

DIVISION 36 -- RESERVED (NOT USED)

DIVISION 37 -- RESERVED (NOT USED)

DIVISION 38 -- RESERVED (NOT USED)

DIVISION 39 -- RESERVED (NOT USED)

DIVISION 40 -- PROCESS INTEGRATION

40 9119 - Temperature Monitoring Equipment

DIVISION 41 -- MATERIAL PROCESSING AND HANDLING EQUIPMENT (NOT USED)

DIVISION 42 -- PROCESS HEATING, COOLING, AND DRYING EQUIPMENT (NOT USED)

DIVISION 43 -- PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT (NOT USED)

DIVISION 44 -- POLLUTION CONTROL EQUIPMENT (NOT USED)

DIVISION 45 -- INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT (NOT USED)

DIVISION 46 -- WATER AND WASTEWATER EQUIPMENT (NOT USED)

DIVISION 47 -- RESERVED (NOT USED)

DIVISION 48 -- ELECTRICAL POWER GENERATION (NOT USED)

DIVISION 49 -- RESERVED (NOT USED)

END OF SECTION 00 0010

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SECTION 00 0101 - PROJECT IDENTIFICATION PAGE

PART 1 - GENERAL

1.1 PROJECT IDENTIFICATION INFORMATION

A. Project:
1. Montgomery County
2. New Live Fire Training Building
3. Public Safety Training Center, Plymouth Township
4. 1175 Conshohocken Road, Conshohocken, Pennsylvania19428.
5. Architect's Project Number: 23-209.

B. Owner: Montgomery County.
1. Address: P.O. Box 311, Norristown, Pennsylvania 19404

C. Architect: Design Professional of Record
1. Manns Woodward Studios, Inc.
2. Address: 8098 Sandpiper Circle, Suite H, Nottingham, Maryland 21236
3. Phone Number: 410-344-1460

D. Project Submission Title: 100% Construction Documents.

E. Project Submission Date: May 21, 2026.

F. Copyright 2026 Manns Woodward Studio, Inc.. All rights reserved.

PART - 2 PRODUCTS (NOT USED)

PART - 3 EXECUTION (NOT USED)

END OF SECTION 00 0101

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SECTION 00 0103 - PROJECT DIRECTORY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Identification of project team members and their contact information.
   1. Owner
      a. Owner
      b. Owner's Using Agency

B. Architect and Architect's Consultants
   1. Civil Engineering Consultant
   2. Structural Engineering Consultant
   3. Geotechnical Engineering Consultant
   4. Mechanical, Plumbing, Electrical Engineering Consultant

C. Owner's Other Consultants
   1. Construction Manager as Advisor; CMa

1.2 OWNER:

A. Name: Montgomery County
   1. Address: P.O. Box 311 .
   2. City: Norristown.
   3. State: Pennsylvania.
   4. Zip Code: 19404.
   5. Telephone: 267-781-4039.
   6. Primary Contact:
      a. Title: Capital Projects Manager, Department of Assets & Infrastructure
      b. Name: Stephen Sinclair
      c. E-mail: stephen.sinclair@montgomerycountypa.gov
      d. Telephone: 267-781-4039

B. Owner's Using Agency: Public Safety Training Campus (PSTC), Department of Public Safety.
   1. Address: 1175 Conshohocken Road.
   2. City: Conshohocken.
   3. State: Pennsylvania.
   4. Zip Code: 19428.
   5. Primary Contact:
      a. Title: Deputy Director - Fire Programs
      b. Name: Robert Carovillano
      c. E-mail: robert.carovillano@montgomerycountypa.gov
      d. Telephone: 610-298-3500 ext. 6610

C. Primary Contact: All correspondence from the Prime Contractors to the Owner and Owner's Using Agency will be through the CMa, unless alternate arrangements are mutually agreed upon at preconstruction meeting.

1.3 ARCHITECT AND ARCHITECT'S CONSULTANTS:

A. Correspondence: All correspondence from the Prime Contractors regarding construction documents authored by the Architect or the Architect's consultants will be through the CMa, unless alternate arrangements are mutually agreed upon at the preconstruction meeting and recorded within the meeting minutes.

B. Architect: Design Professional of Record.
1. Company Name: Manns Woodward Studios, Inc. (MW Studios).
a. Address: 8098 Sandpiper Circle, Suite H.
b. City: Nottingham.
c. State: Maryland.
d. Zip Code: 21236.
e. Telephone: 410-344-1460.
f. Fax: 443-403-2460.
2. Primary Contact - Architect/Designer:
a. Name: John Bailey.
b. Phone Number: 410-344-1460.
c. Email: jbailey@mwsarch.com.

C. Civil Engineering Consultant:
1. Company Name: Benesch.
a. Address: 400 One Norwegian Plaza, Pottsville, Pennsylvania 17901
b. Telephone: 570-622-4055
c. Primary Contact:
1) Name: Kevin Marmas.
2) Email: kmarmas@benesch.com.

D. Structural Engineering Consultant:
1. Company Name: Benesch.
a. Address: 250 Cetronia Road, Suite 150, Allentown, Pennsylvania 18104
b. Telephone: 610-439-7066
c. Primary Contact:
1) Name: Michael Rohl.
2) Email: mrohl@benesch.com.

E. Geotechnical Engineering Consultant:
1. Company Name: ECS Mid-Atlantic, LLC.
a. Address: 11000 Commerce Parkway, Mt. Laurel, New Jersey 0805
b. Telephone: 609-832-3910
c. Primary Contact:
1) Name: Jeffrey Yates.

2) Email: jcyates@ecslimited.com.

F. Mechanical, Plumbing, Electrical Engineering Consultant
1. Company Name: DEDC, LLC.
a. Address: 30 S 17th Street, Philadelphia, Pennsylvania 19103.
b. Telephone: 267-804-7286.
c. Pimary Contact: Mechanical
1) Name: Scott Frenck.
2) Email: sfrenck@dedc-eng.com.

1.4 OWNER'S OTHER CONSULTANTS

A. Construction Manager, CMa:
1. Company Name: Boyle Construction, Inc..
a. Address: 3850 Sierra Circle, Suite 400, Center Valley, Pennsylvania 18034.
b. Telephone: 484-223-0726.
c. Primary Contact:
1) Name: Christian Donovan.
2) Email: cdonovan@boyleconstruction.com.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 00 0103

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SECTION 00 0115 - LIST OF DRAWING SHEETS

PART - 1 GENERAL

1.1 LIST OF DRAWINGS

A. Drawings shall consist of the following separately bound drawing sets or separate drawings:
1. General, Civil, Architectural, Structural, Mechanical, and Electrical:
a. Drawings shall include, but not be limited to, the Contract Drawings and drawings listed within the DRAWING INDEX located on sheet G000 "COVER SHEET" of the separately bound drawing set titled Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township dated May 21, 2026, as modified by subsequent Addenda and Contract Modifications.

END OF SECTION 00 0115

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SECTION 00 2600 - PROCUREMENT SUBSTITUTION PROCEDURES

PROCUREMENT SUBSTITUTION PROCEDURE

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 01 2500 - Substitution Procedures for conditions under which Substitution requests will be considered following Contract award.

C. Long Lead Times/Items: Any commodity, material, or equipment that has a procurement time including but not limited to, delegated design, submittal review, fabrication, and/or delivery, of greater than 20 weeks or 5 months.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Long Lead Times/Items: Substitutions for commodities, materials, and/or equipment with long lead times, where possible, must be submitted and approved prior to the project Bid Date. Contractor shall be required to provide a list of long lead time items within 15 days after Notice to Proceed.

B. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

C. Procurement Substitution Requests will be received and considered by CMa when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
   1. Extensive revisions to the Contract Documents are not required.
   2. Revisions to other Prime Contract Packages are not required.
   3. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
   4. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to CMa. Procurement Substitution Request must be made in writing by Prime Contract Package Bidder only and must be in compliance with the following requirements:
   1. Requests for substitution of materials and equipment will be considered if received no later than 14 calendar days prior to date of bid opening.
   2. Submittal Format: Submit one digital copy of each written Procurement Substitution Request using the form bound in Project Manual.

B. CMa and/or Architect's Action:
   1. CMaand/or Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. If approved, CMa will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. CMa's or Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF SECTION 00 2600

SECTION 00 3100 - AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.1 INFORMATION AVAILABLE TO BIDDERS

A. Certain information relating to existing surface and subsurface conditions and structures is available to Bidders for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. The information available shall not be a warranty or guarantee of existing conditions. The information available will not be part of the Contract Documents.

1.2 EXISTING CONDITIONS

A. Existing drawings and/or reports that include information on existing conditions are as follows:

B. Site Drawing: Entitled Boundary And Topographic Plan, Municipal Police Academy, dated 8-15-18 created by Bursich, 2129 East High Street, Pottstown, PA 19464.
1. A reduced scale reproduction of the original site drawing is appended to this document.
2. An original copy is available for information only within the drawing set of the Contract Documents.

C. Geotechnical Report: Entitled Montgomery County Fire Training Building, 1175 Conshohocken Road, Conshohocken, Montgomery County, Pennsylvania, ECS Project No. 44:2244, dated March 17, 2026.
1. A copy of the original report is available for viewing as appended to this document.
2. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Ower is not responsible for interpretations or conclusions drawn from the data.
3. Any party using information described in the geotechnical report shall make additional test borings and conduct other exporatory operations that mey be required to determine the character of subsurface materials tha may be encountered.
4. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in Contract Documents.
5. Because subsurface conditions indicated by the sooil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

1.3 PERMITS

A. The Prime Contractors shall be responsible for tracking the expiration of all permits related to their Scope of Work during the course of construction up to project closeout unless otherwise indicated. The Prime Contractors shall notify in writing the Architect, Owner, and Construction Manager (CMa) a minimum of 60 calendar days prior to the expiration of any permit. The Prime Contractors shall be responsible for any/all

costs incurred to renew all permits related to their Scope of Work as well as any/all costs for delays and damages as a result of failing to renew such permits by the expiration deadline.

B. The Architect/Owner has applied for the following permits:
   1. Site work and GradingPermit.
      a. Status: Under review
   2. General Building Permit.
      a. Status: Under review

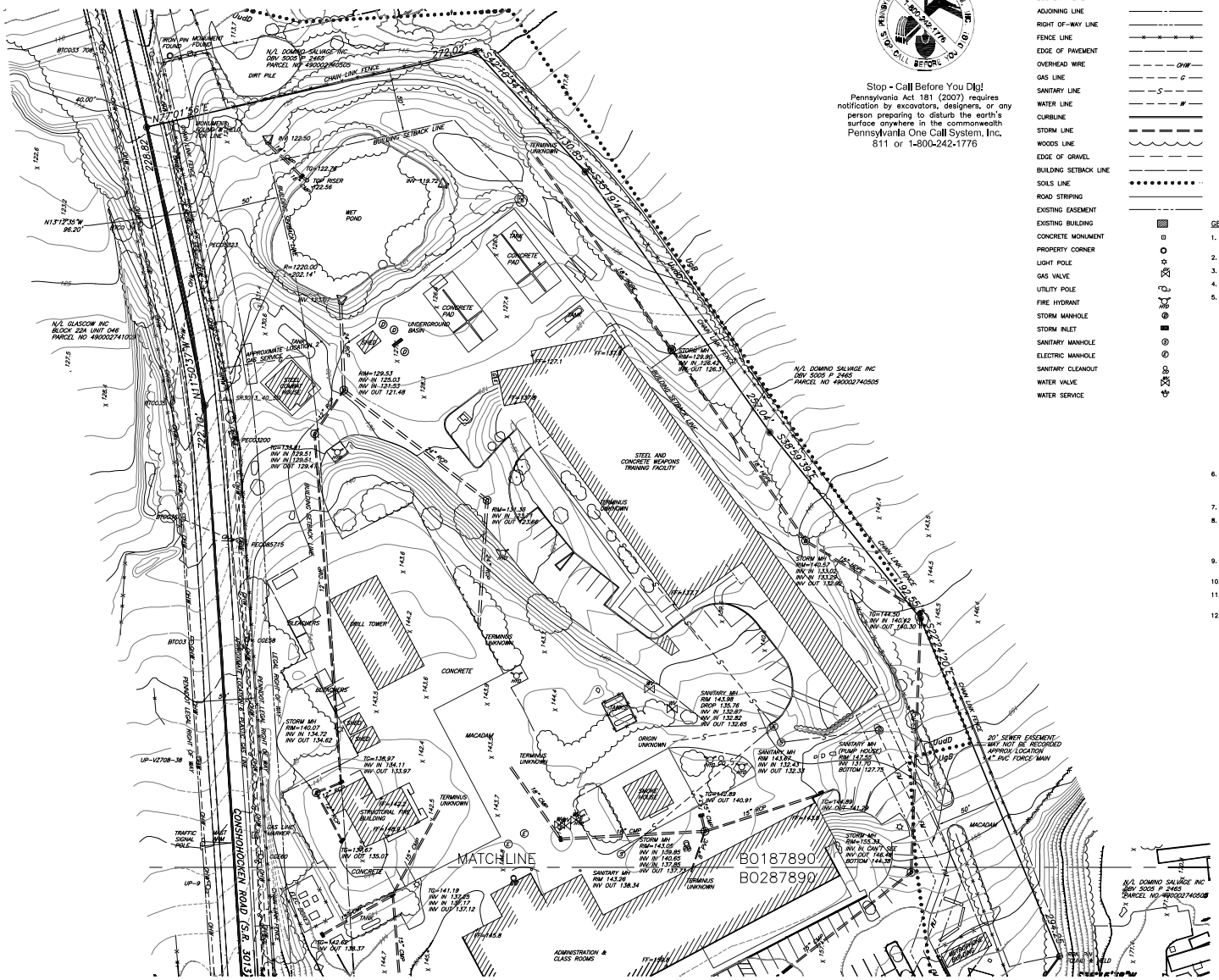
PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 OBTAINMENT OF PERMITS

A. Each Prime Contractor will secure and pay for all permits required to complete their Scope of Work with the exception of the General Building Permit and Grading Permit. The Owner will be responsible for the submission and cost of the General Building Permit and the Grading Permit.
   1. Each Prime Contractor is responsible to complete and submit all necessary forms, produce and submit all necessary drawings, and provide all other necessary items and payments to Plymouth Township, Montgomery County, the State of Pennsylvania or other AHJ as required to secure permits to complete their Scope of Work.

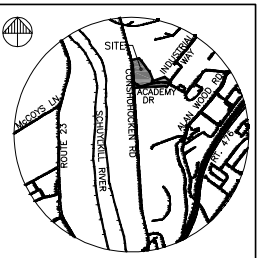
END OF SECTION 00 3100



Stop - Call Before You Dig!
Pennsylvania Act 181 (2007) requires notification by excavators, designers, or any person preparing to disturb the earth's surface anywhere in the commonwealth
Pennsylvania One Call System, Inc.
811 or 1-800-242-1776

LEGEND

- BOUNDARY LINE
- ADJOINING LINE
- RIGHT OF-WAY LINE
- FENCE LINE
- EDGE OF PAVEMENT
- OVERHEAD WIRE
- GAS LINE
- SANITARY LINE
- WATER LINE
- CURBLINE
- STORM LINE
- WOODS LINE
- EDGE OF GRAVEL
- BUILDING SETBACK LINE
- SOILS LINE
- ROAD STRIPING
- EXISTING EASEMENT
- EXISTING BUILDING
- CONCRETE MONUMENT
- PROPERTY CORNER
- LIGHT POLE
- GAS VALVE
- UTILITY POLE
- FIRE HYDRANT
- STORM MANHOLE
- STORM INLET
- SANITARY MANHOLE
- ELECTRIC MANHOLE
- SANITARY CLEANOUT
- WATER VALVE
- WATER SERVICE



LOCATION MAP
SCALE: 1" = 2000'

GENERAL NOTES

1. BOUNDARY SURVEY SHOWN HEREON IS BASED ON A FIELD SURVEY PERFORMED BY BURSICH ASSOCIATES, INC. ON MAY 30, 2018.
2. TOPOGRAPHIC INFORMATION AS SHOWN OBTAINED BY AERIAL MAPPING BY PROMAPS JUNE 2018.
3. HORIZONTAL DATUM: NAD83 PA SPC SOUTH ZONE.
4. VERTICAL DATUM: NAVD88.
5. REFERENCE PLANS:

   SITE PLAN – PARKING ADDITION IMPROVEMENTS – PREPARED FOR MONTGOMERY COUNTY FIRE ACADEMY SHEETS 1 THROUGH 2. DATED 12/14/1994. PROJECT NO. 94037, PREPARED BY URWILER & WALTER, INC.

   RECORD PLAN – MONTGOMERY COUNTY FIRE ACADEMY. DATED 8/02/2000, LAST REVISED 5/01/2000. PROJECT NO. 93-246 – PREPARED NAVE NEWELL & STAMPFL LTD.

   SUBDIVISION PLAN – PLAN FOR SALE OF VETRANS QUARRY – DATED NOVEMBER 1991, LAST REVISED APRIL 1992. PROJECT NO. 27993, PREPARED BY GANNETT FLEMING, INC.

   WEAPONS TRAINING RANGE FOR MONTGOMERY COUNTY FIRE ACADEMY – DATED 2/14/2003 AND LAST REVISED 3/07/2003. PREPARED BY TREBY-HOWARD-PHILIPS-ARCHITECTS-PLANNERS.

   SITE PLAN – MONTGOMERY COUNTY WEAPONS TRAINING FACILITY – DATED 04/03/2006, PROJECT NO. 110806.0NC. PREPARED BY KIMMEL BORGRETTE.

   RECORD PLAN – 3 ACRE PARCEL SUBDIVISION. DATED 04/14/1998, LAST REVISED 08/07/1998. PROJECT NUMBER 931417-3. PREPARED BY BENCHMARK CONSULTING ENGINEERS & SURVEYORS.

   COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF HIGHWAYS DRAWINGS FOR CONSTRUCTION ROUTE NO. 46107 SECTION 3, STATION 33+03.20 TO 64+50.00 RECORDED IN MONTGOMERY COUNTY RECORDS BOOK NO. 15, DATED SEPTEMBER 3, 1964. SHEET 3 OF 14, GENERAL NOTES LEGAL RIGHT OF WAY WIDTH 50 FEET.
6. RECORD OWNER:
   MONTGOMERY COUNTY
   P.O. BOX 311
   NORRISTON, PA 19404
7. TAX PARCEL NUMBER: 49-00-02741-50-4
8. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
9. THE PENNSYLVANIA ONE CALL SYSTEM ACT 38 SERIAL NUMBER FOR THIS PROJECT IS 20181422590, DATED 5/22/2018.
10. NO WETLAND DELINEATION WAS PERFORMED FOR THIS SITE.
11. THE PROPERTY IS NOT LOCATED WITHIN A 100-YEAR FLOODPLAIN PER FEMA FLOOD INSURANCE RATE MAP 42091C0352G, EFFECTIVE DATE: 03/02/2016.
12. THIS SURVEY WAS DONE WITHOUT THE BENEFIT OF A TITLE REPORT.

ZONING DATA

ARTICLE XV. HEAVY INDUSTRIAL DISTRICTS

	REQUIRED
MINIMUM DISTRICT AREA	6 AC.
MINIMUM LOT AREA	2 AC.
MINIMUM LOT FRONTAGE	200 FT.
MAXIMUM BUILDING COVERAGE	33.33%
MAXIMUM IMPERVIOUS COVERAGE	85.0%
MAXIMUM BUILDING HEIGHT	60'

BUILDING SETBACK REQUIREMENTS:

FRONT YARD	50 FT.
SIDE YARD	50 FT.
REAR YARD	50 FT.
**ANY SETBACK REQUIREMENT SHALL BE INCREASED TO ONE HUNDRED (100) FEET WHERE IT ABUTS A RESIDENTIAL DISTRICT	
**GREEN SPACE AREA REQUIREMENT:	≥15%

PARKING SETBACK:

FRONT YARD	25 FT.
SIDE YARD	10 FT.
REAR YARD	25 FT.
**ANY SETBACK REQUIREMENT SHALL BE INCREASED TO ONE HUNDRED (100) FEET WHERE IT ABUTS A RESIDENTIAL DISTRICT	

SOILS LEGEND

SOILS UNIT	DESCRIPTION
Pt	PITS, QUARRY
UgB	URBAN LAND, 0 TO 8 PERCENT SLOPES
UudD	URBAN LAND–UDORTHENTS, LINESTONE COMPLEX, 8 TO 25 PERCENT SLOPES

SITE DATA

TRACT AREA, GROSS	16.868 AC.
TRACT AREA, NET	16.312 AC.

0 40 80
GRAPHIC SCALE
SCALE: 1" = 40'

NO.	REVISION	DATE	BY

SEAL
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL DANE K. MOYER LAND SURVEYOR No. SU-068813
Dane K. Moyer, P.L.S.

SEAL

MANAGER MDP	
DESIGN	CHKD. BY DKM
DRAFT TLJ	CHKD. BY
FILE TRA-01	DATE 8-15-18
NOTES FB 706	SCALE 1"= 40'

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TRAFFIC PLANNING AND DESIGN, INC.
2500 E. HIGH STREET, SUITE 650
POTTSTOWN, PA 19464

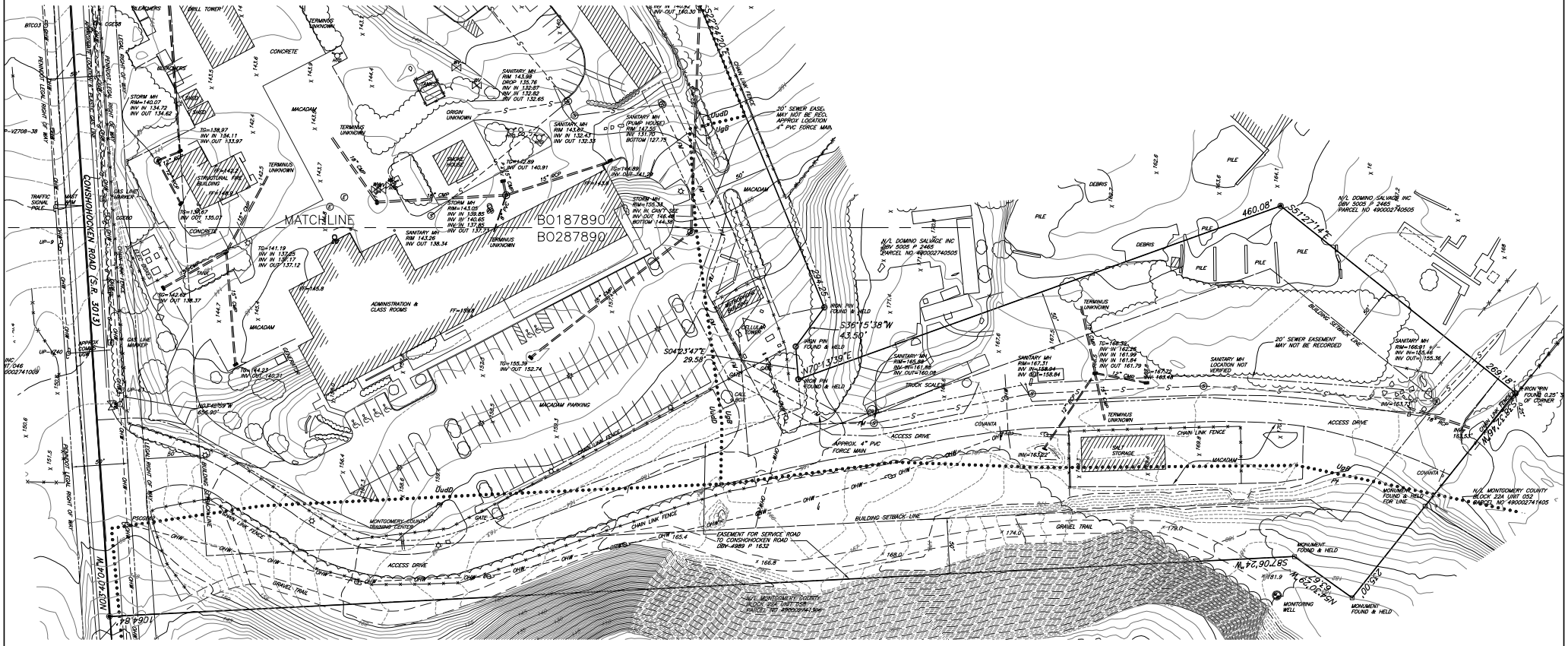
SUBJECT
BOUNDARY AND TOPOGRAPHIC PLAN

MUNICIPAL POLICE ACADEMY

PLYMOURH TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA

JOB NO. 187890
SHEET NO. 1 OF 2
DWG. NO. B0187890

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NO.	REVISION	DATE	BY

SEAL
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DANE K. MOYER
LAND SURVEYOR
No. SU-068811-E
Dane K. Moyer, P.L.S.

SEAL

MANAGER MDP	
DESIGN	CHKD. BY DKM
DRAFT TLJ	CHKD. BY
FILE TRA-01	DATE 8-15-18
NOTES FB 706	SCALE 1"= 40'

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SUBJECT
BOUNDARY AND TOPOGRAPHIC PLAN

MUNICIPAL POLICE ACADEMY

PLYMOURH TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA

JOB NO. 187890
SHEET NO. 2 OF 2
DWG. NO. B0287890

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ECS Mid-Atlantic, LLC

Geotechnical Engineering Report

Montgomery County Fire Training Building

1175 Conshohocken Road
Conshohocken, Montgomery County, Pennsylvania

ECS Project No. 44:2244

March 17, 2026

March 17, 2026

Mr. Josh Miller
MW Studios
8098 Sandpiper Circle, Suite H
Nottingham, MD 21236

ECS Project No. 44:2244

Reference: Geotechnical Engineering Report
Montgomery County Fire Training Building
1175 Conshohocken Road
Conshohocken, Montgomery County, Pennsylvania

Dear Mr. Miller:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our revised proposal dated December 11, 2025 (ECS Proposal No. 44:2501-GPR), which was authorized on December 11, 2025. This report presents our understanding of the geotechnical aspects of the project along with the results from the field exploration performed and our design and construction recommendations.

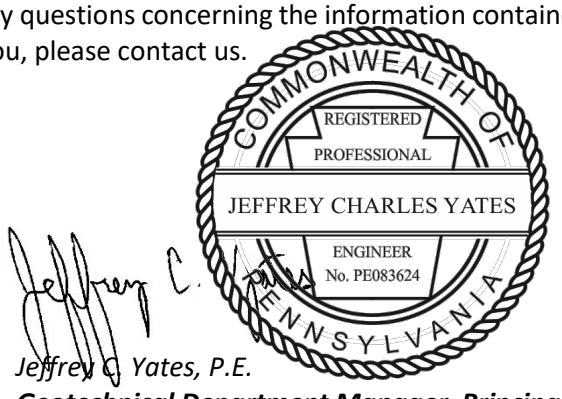
It has been our pleasure to be of service to MW Studios during this phase of the project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to document subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Mid-Atlantic, LLC



Maddie C. Trudnak
Staff Geotechnical Project Manager
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Jeffrey C. Yates, P.E.
Geotechnical Department Manager, Principal
jcyates@ecslimited.com

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- Boring Location Diagram(s)
- Subsurface Cross-Section(s)
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- Reference Notes
- Exploration Procedures
- Boring Logs
- Test Pit Logs
- Cased Borehole Logs
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- Rock Core Photolog

Appendix C – Laboratory Testing

- Laboratory Test Summary
- Grain Size Analysis/Analyses
- Plasticity Chart(s)

Appendix D – Supplemental Documents

- Sinkhole Repair Details

EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned project. Further, our preliminary foundation recommendations are summarized. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical engineering report.

The proposed redevelopment will include the construction of an approximately 2,500 square-foot and 1,300 square-foot, live fire training structures as part of an overall site redevelopment.

- Project grading plans were not provided; however, architectural plans including the buildings' proposed finished floor elevations (FFE) were provided. The south fire training building FFE is El. 145.5 with a basement level slab elevation of El. 140.5. The north fire training building FFE is El. 145.0 with a basement level slab elevation of 138.0. Once a final grading plan is provided, it should be provided to ECS so we can review and confirm the recommendations included herein need to be changed/updated.

- Considering the FFE noted above, the bottom of the foundations will be bearing in a combination of newly placed structural fill, natural soils, and weathered rock. Foundations may be proportioned assuming a net allowable bearing capacity of 4,000 pounds per square foot (psf) and 3,000 psf for the south fire training building and the north fire training building, respectively, if the recommendations herein are followed.

- Existing fill materials were observed within several of the borings. Existing fills (without documentation of proper placement) are generally not suitable for foundation support and would require removal under foundation elements; however, footing excavation is likely to extend beyond the existing fill. Some undercuts of existing fills may be required during construction should they be encountered.

- Following proper site preparation techniques, we believe the foundations will be capable of supporting the indicated loading with the potential for total post-construction settlement of less than 1-inch and a differential settlement of less than 0.5-inch.

- The floor slab may be supported on-grade and designed assuming a modulus of subgrade reaction, k_1, of 90 pounds per cubic inch and our subgrade recommendations.

- Relatively shallow refusal (within 20 feet of existing ground surface) was encountered in three (3) of the borings on the underlying rock surface. Some weathered rock, with the possibility of intact rock excavation, will likely be required during excavation of the foundation elements, during utility installation, and in areas of cut on the site.

- The recommended seismic Site Class for the project site location is "C".

- Groundwater was not observed in the borings to the depths explored. We believe construction dewatering at this site will be mainly limited to removing accumulated rainwater, localized perched water, and some minor seepage into excavations.

- Infiltration testing was performed at five locations on the site and the results are included herein.

Please refer to the body of the report for further details on subsurface conditions encountered within the completed borings and for our preliminary geotechnical engineering recommendations for the project.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design and construction of a new fire training facility located in Conshohocken, Montgomery County, Pennsylvania (project site). The project will include the construction of an approximately 2,500 square-foot, four-story building and an approximately 1,300 square-foot, two-story building with associated ancillary structures as part of the additional development to the overall project site. The recommendations developed for this report are based on the project information supplied to ECS, which consisted of the following:

- Architectural plan set entitled. "35% Schematic Design," prepared by MW Studios. Dated November 4, 2025;
- Existing conditions plan entitled, "Boundary and Topographic Plan – Municipal Police Academy," prepared by Burisch, dated August 15, 2018;
- CPT exploration report, entitled, "Presentation of Site Investigations Results," prepared by Contec, dated August 4, 2023.

Our services were performed in general accordance with our revised proposal dated December 11, 2025 (ECS Proposal No. 44:2501-GPR), which was authorized by Mr. Gary Campbell of MW Studios on December 11, 2025.

This report contains the procedures and results of our subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- A review of surface topographical features and site conditions;
- A brief review and description of our field and laboratory test procedures and the results of testing conducted;
- A review of subsurface soil stratigraphy with pertinent physical properties;
- Final exploration logs;
- Infiltration testing results;
- Recommended foundation type, bearing capacity, and estimated settlement;
- Recommendations for slab on grade construction;
- Recommendations for seismic site classification in accordance with the 2021 International Building Code;
- Groundwater observations and recommendations for consideration in engineering design and construction;
- Recommended minimum flexible and rigid pavement sections; and,
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills and identification of potentially unsuitable soils.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located at 1175 Conshohocken Road, in Conshohocken, Montgomery County, Pennsylvania, as shown in Figure 2.1.1 below. The project site is the location of the existing Montgomery County Public Safety Training Campus and its associated buildings, training features, pavement areas, parking lots and drive aisles. Additionally, a stormwater management (SWM) basin and grassy areas are located on the northern end of the campus. The project site is bound by parking lots and drive aisles associated with IAA Philadelphia to the north and east, Academy Drive to the south, and Conshohocken Road to the west.



Figure 2.1.1 - Site Location (outlined)

The current topography at the site generally slopes downward from south to north with an estimated variation in ground surface elevation of about ±45 feet.

Based on geological mapping, the site appears to be underlain by the Ledger Formation. The Ledger Formation is described as light gray, locally mottled, massive, pure, coarsely crystalline dolomite; siliceous in the middle part. The Ledger Formation is susceptible to karst processes.

2.2 PROPOSED CONSTRUCTION

Based upon the information provided to ECS, we understand the proposed project will include the construction of two buildings as part of a new fire training facility including an approximately 2,500 square-foot building, four-story building (south) and an approximately 1,300 square-foot, two-story building (north) with associated ancillary structures. We understand partial, below grade levels are

planned in each building location. Additionally, the site development will include a new recovery pavilion, new propane tank pad and proposed concrete slab replacement.

A topographic drawing with existing features was provided; however proposed grading was not. The architectural plans provided included the finished floor elevations (FFE) for the south and north buildings and they are El. 145.5 and El, 145.0, respectively, with basement slab elevations of El. 140.5 and El. 138.0, respectively. Based on the information provided, the building structure will not have individual column footings, and the majority of the structure elements will be supported on load bearing walls. The wall loads will vary by location and are anticipated to be higher than what would be expected for a conventional building with beam/column framing. Our understanding of the project is summarized below.

SUBJECT	DESIGN INFORMATION / EXPECTATIONS
Building Footprints	South: Approximately 2,500 square feet in plan view North: Approximately 1,300 square feet in plan view
# of Stories	South: 4 stories above grade North: 2 stories above grade
Usage	Institutional
Building Loads	Wall: 31 kips/ft Slab: 200 psf
Floor Elevation (FFE)	South: El. 145.5 with basement slab El. 140.5 North: El. 145.0 with basement slab El. 138.0

Given the proposed grades, the maximum cuts and fills are anticipated to be in the order of 5 feet and 2 feet, respectively. Due to anticipated shallow bedrock on site, excavation of weathered rock to reach design grades may be necessary. A site retaining wall is shown on the plans to provide grade separation between the propane tank pad and existing grade; however, it appears to be less than 4 feet in height.

If actual loads differ from those provided above, ECS should be contacted to provide updated recommendations, if applicable.

In addition, ECS understands that the site development will also include a detention basin and a stormwater management (SWM) soil amendment BMP. Dedicated exploration and infiltration testing associated with the SWM facilities have been performed. Additionally, infiltration testing via cased borehole was completed in the area of the slab replacement. Test depths and elevations were provided by ECS and approved by MW Studios.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B in the inserts titled Subsurface Exploration Procedures. Our overall scope of work, completed with two (2) authorized mobilizations, consisted of drilling eight (8) soil test borings and excavating four (4) test pits. Each exploration location was located using a hand-held Global Positioning System device, and their approximate, as-completed locations are shown on the Exploration Location Diagram Location Diagram in Appendix A. Elevations on the boring logs were interpolated from the existing grades shown on the "Boundary and Topographic Plan – Municipal Police Academy" provided by MW Studios.

Soil test borings were completed with a track-mounted, hollow-stem auger drill rig equipped with a manual drop hammer for conducting Standard Penetration Testing (SPT). SPT testing is utilized to measure N-values and obtain samples of the subsurface materials encountered.

3.1 Subsurface Characterizations

Generally, the subsurface conditions encountered were consistent with the published geologic mapping available from the Pennsylvania Department of Conservation and Natural Resources via PaGEODE and the United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) via Web Soil Survey for the general site vicinity. Refer to Appendix A for geologic maps for the general vicinity of the project site.

Generalized characterizations of the materials encountered within the completed explorations are tabulated below. Refer to the Generalized Subsurface Soil Profiles in Appendix A and the Geotechnical Borehole Logs in Appendix B for more complete soil descriptions.

STRATUM	APPROXIMATE DEPTH ENCOUNTERED (feet-bgs)	DESCRIPTIONS	RANGES OF SPT[(1)] N-VALUES (bpf)[(2)]
Surface Cover	0.0 – 0.8	• 3 to 9 inches of topsoil • 4 to 6 inches of asphalt • 8 inches of concrete at Boring B-07	N/A
STRATUM I (Fill Materials)	0.3 – 15.0	• USCS: GC, ML, SM • Very loose to medium dense granular materials • Moist • Encountered at surface in Borings B-03, B-05 through B-08, and Test Pits TP-01, TP-02, and TP-04 • Moist	3 - 20
STRATUM II (Natural Soils)	0.0 – 36.5	• USCS: ML, SM, SC-SM, GC, SP, CL • Very loose to very dense granular materials • Firm to stiff fine-grained materials • Moist • Encountered at surface, below surface cover, and/or below Stratum I in each of the borings • Auger refusal encountered within this stratum in Borings B-05 and B-06	3 – 56
STRATUM III (Weathered Rock)	6.0 – 28.0	• Weathered Rock sampled as USCS: SM, GM, GP • Very dense granular materials • Moist • Encountered below Stratum II in B-01, B-02, B-04, and B-05	> 60

STRATUM	APPROXIMATE DEPTH ENCOUNTERED (feet-bgs)	DESCRIPTIONS	RANGES OF SPT[(1)] N-VALUES (bpf)[(2)]
STRATUM IV (Bedrock)	14.4 – 20.0	• Dolostone of the Ledger Formation • Moderately to slightly weathered • White • Recovery: 28 – 80% • RQD: 18% (Very Poor)	N/A

Notes:
(1) Standard Penetration Testing
(2) Blows per foot

Soils encountered were visually classified during borehole logging on the basis of texture and plasticity in general accordance with ASTM D2488 – *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)* and use of Unified Soil Classification System (USCS) symbols. After classification, the samples were grouped in the major zones noted on the Generalized Subsurface Cross-Section A-A' in Appendix A and the exploration logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. Divisions between strata on the exploration logs are approximate; in-situ, the transitions may be gradual.

3.2 Groundwater Observations

Water levels were measured in our boring logs in Appendix B. Groundwater was not observed within the borings at the time of drilling and prior to backfilling. However, it must be noted that variations in perched water levels and long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

3.3 Stormwater Infiltration Testing

Infiltration testing was completed using the double ring infiltration method in general accordance with Appendix C of the Pennsylvania Stormwater Best Management Practices (PA BMP) Manual. Infiltration test results are provided in the following table. The infiltration rate column below includes a safety factor as shown in the notes below the table; unfactored rates are in Appendix B.

INFILTRATION TESTING RESULTS							
TEST LOCATION	SURFACE ELEVATION (Feet)[1]	LIMITING ZONE[6] DEPTH (Feet)[5]	BOTTOM OF TEST EXPLORATION (Feet)	INFILTRATION TEST DEPTH (Feet)	TEST ELEVATION (Feet)[2]	TEST METHOD[3]	FIELD INFILTRATION RATE (inches/hour) [includes FS][4]
TP-01A	141.0	4.2	136.8	2.3	138.7	DR	0.25
TP-02A	141.5	NE	138.5	1.0	140.5	DR	0.00
TP-03A	138.0	NE	134.6	1.0	137.0	DR	0.00
TP-04A	134.0	NE	131.0	1.0	133.0	DR	0.00
B-07	141.0	NE	121.0	6.0	135.0	CB	0.00

(1) Surface elevations interpreted from the existing conditions plan provided by Bohler
(2) Infiltration elevations provided by MW Studios
(3) DR = Double Ring Infiltration Testing; CB = Cased Borehole
(4) F.S. = 2.0 applied

(5) NE = Not Encountered within the extents of test pits.
(6) Limiting Zone defined as bedrock, groundwater, etc

3.4 Laboratory Testing

The laboratory testing consisted of index property tests performed on selected samples obtained during our field exploration operations. Each laboratory test was completed in accordance with the applicable ASTM Standard Test Method as indicated below and on the laboratory testing sheets included in Appendix C.

- ASTM D2216: *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock Mass*
- ASTM D4318: *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*
- ASTM D6913: *Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis*

Soil samples from this exploration program will be retained in our laboratory for a period of sixty (60) calendar days from date of collection, corresponding to the date of completion indicated on the exploration logs. After this time, the samples will be discarded unless other instructions are received from MW Studios regarding their disposition in advance.

4.0 DESIGN RECOMMENDATIONS

4.1 Shallow Foundations

Site plans featuring existing topography and proposed site grading were provided; we understand the finished floor elevation (FFE) of the south and north buildings are El. 145.0 and El. 145.5, respectively. Provided subgrades and Structural Fills are prepared as recommended in this report, the proposed building can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters.

DESIGN PARAMETER	NORTH BUILDING AND PAVILION WALL FOOTING	SOUTH BUILDING WALL FOOTING
Net Allowable Bearing Pressure(1)	3,000 psf	4,000 psf
Acceptable Bearing Soil Material	Stratum II, III, or IV with SPT N-value ≥ 7 bpf or new Structural Fill	Stratum II, III, or IV with SPT N-value ≥ 11 bpf or new Structural Fill
Minimum Width	24 Inches	24 Inches
Minimum Footing Embedment Depth (below slab or finished grade)(2)	36 inches	36 inches
Estimated Total Settlement(3)	Less than 1-inch	Less than 1-inch
Estimated Differential Settlement(3)	Less than 0.5-inch over 50 feet	Less than 0.5-inch over 50 feet

Notes:

(1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

(2) Minimum footing depth recommended for frost protection. Interior foundations located within permanently heated portions of the structure may be established at conventional depths below the floor slab, provided that they are established within the intended bearing stratum.

(3) Based on an assumed maximum wall load of 31 kips per foot. When final design loads are determined, ECS must be contacted to update foundation recommendations and settlement calculations.

bpf = blows per foot

Potential Undercuts: As indicated in the above table, shallow foundations at the south building may be supported by Stratum II, III, or IV materials provided the material at bearing depth is natural soils with at least an SPT N-Value of ≥ 11 or newly placed Structural Fill. Shallow foundations at the north building may be supported by Stratum II, III, or IV materials provided the material at bearing depth is natural soils with at least an SPT N-Value of ≥ 7 or newly placed Structural Fill. It is important to have ECS observe and test footing subgrade prior to placing foundation concrete to confirm soil conditions are as anticipated (granular soil with SPT N-value ≥ 11 or 7 bpf) and consistent with our recommended foundation design parameters.

Existing fills are generally not suitable for support of foundations as the method of their placement and compaction effort (or lack thereof) is unknown. They may be prone to settlements which are unpredictable; therefore, we recommend these materials be removed below foundation elements. Some undercutting during construction is anticipated during foundation excavation, particularly around Boring B-03 where undercuts in the order of 2 feet may be required.

If fills, soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with lean concrete ($f'_c \geq 1{,}000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete.

4.2 Slabs on Grade

Provided subgrades and Structural Fills are prepared as discussed herein, the proposed floor slab can be constructed as a ground-supported slab (slab-on-grade). The entire slab footprint must be proofrolled (see Section 5.1.3) and compacted prior to placing the Granular Capillary Break/Drainage Layer. It is important to have ECS observe the subgrade and proofrolling to confirm the soil conditions are as anticipated. Soft or yielding soils may be encountered in some areas and should be removed and replaced with compacted Structural Fill in accordance with the recommendations included in this report. The following graphic depicts our soil-supported slab recommendations:

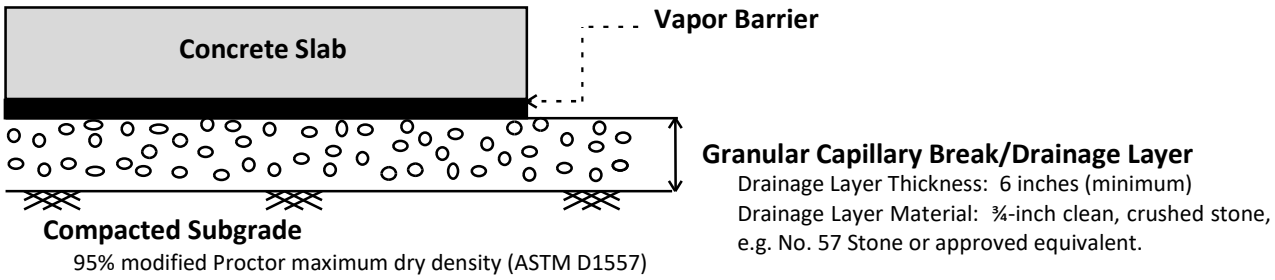


Figure 4.2.1 – Ground-supported Concrete Slab

Subgrade Modulus: Provided the Structural Fill and Granular Capillary Break/Drainage Layer are constructed in accordance with our recommendations, floor slabs may be designed assuming a modulus of subgrade reaction, k_1, of 90 pounds per cubic inch (pci). The modulus of subgrade reaction value is based on a 1-foot by 1-foot plate load test.

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor barrier.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab such as in a drop down footing/monolithic slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

4.3 Seismic Design Considerations

Seismic Site Classification: The 2021 International Building Code – New Jersey Edition (2021 IBC-NJ), which references ASCE/SEI 7-16 – *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, requires site classification for seismic design based on the upper 100 feet of a soil profile. Our authorized scope of services for the project did not include a site-specific seismic Site Class determination (e.g., 100 -foot soil profile). Therefore, as to determine the seismic Site Class using Section 5.5 of the 2019 New Jersey Hazard Mitigation Plan was referenced. The statewide seismic Site Class map contained in Section 5.5 (Figure 5.5-2), indicates the appropriate seismic Site Class is “C.”

The Site Class definition should not be confused with the Seismic Design Category designation, which the Structural Engineer typically assesses. If a higher seismic Site Class is beneficial to the project, additional testing services could be provided that may yield a more favorable result.

Ground Motion Parameters: In addition to the seismic Site Class noted above, ECS has determined the design spectral response acceleration parameters consistent with the methodology of the 2021 IBC, which references ASCE/SEI 7-16. We have assumed a structure Risk Category of II. If the structural designer determines a different Risk Category is more appropriate, ECS should be contacted so that we can review our recommendations and provide alternate recommendations. The spectral responses were estimated with the collaborative website tool from the ASCE Hazard Tool (https://ascehazardtool.org). The design responses for the short (0.2 sec, S_{DS}) and 1-second period (S_{D1}) are noted in bold at the far-right end of the following table.

GROUND MOTION PARAMETERS [2021 IBC] – STRUCTURE RISK CATEGORY II								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
Reference	Figures 1613.2.1 (1) & (2)		Tables 1613.2.3 (1) & (2)		Eqs. 16-36 & 16-37		Eqs. 16-38 & 16-39	
0.2	S_S	0.184	F_a	1.3	$S_{MS}=F_aS_s$	0.239	$S_{DS}=2/3\ S_{MS}$	**0.159**
1.0	S_1	0.048	F_v	1.5	$S_{M1}=F_vS_1$	0.072	$S_{D1}=2/3\ S_{M1}$	**0.048**

4.4 Preliminary Pavements

Subgrade Characteristics: We anticipate new asphalt pavements will be supported by Stratum I or II materials or new fill. These soils provide a range of pavement support from moderate to poor with support diminishing as the content of fine-grained soil (silt and/or clay) increases. With increasing fine-grained soil content, soil drainage is reduced and susceptibility to frost increases. Additionally, increasing moisture sensitivity, meaning the soils can soften and decrease in strength with increasing moisture content, also results from increased content of fine-grained soil. Therefore, we recommend pavements to be constructed at the project site be underlain with a graded aggregate subbase placed and compacted over previously proofrolled and compacted subgrade soil. Our pavement recommendations below are predicated on use of a graded aggregate subbase.

California Bearing Ratio (CBR) testing was not performed during this study. Based on our experience with similar soils and considering that the materials encountered consisted of existing very loose to medium dense fill materials, we recommend a design CBR value of 3 be used for preliminary design. Please note that any imported fill materials used in proposed pavement areas will need to meet the CBR value used in design in order to be placed as pavement subgrade material.

Design Assumptions and Criteria: We understand pavements for the project will likely consist of standard-duty flexible pavement section for parking areas and drive lanes as well as a light-duty rigid pavement section. We were not provided traffic loading information, so we have assumed loadings typical for this type of project in the table below.

TRAFFIC ASSUMPTIONS				
Pavement Type	**Vehicles/Day**	**% Heavy Trucks**	**% Cars**	**EASLs**
Light Duty (both flexible and rigid)	300	2	98	42,000

INPUT DESIGN ASSUMPTIONS				
Design Life	**Reliability**	**Initial Serviceability Index**	**Terminal Serviceability Index**	**Subgrade CBR Value**
20 years	90%	4.2	2.8	3.0

The anticipated use of the pavement areas associated with the planned project will be primarily by passenger vehicles with occasional truck traffic associated with deliveries, snow and trash removal, and maintenance. If the actual traffic volumes will exceed these assumptions, ECS should be contacted for revised pavement recommendations; otherwise, increased pavement maintenance and shortened pavement life should be expected.

Minimum Recommended Pavement Sections: The recommended minimum pavement sections as listed in the following table are based upon the anticipated usage and design life discussed, considering a recommended design CBR of 3 percent (i.e., compacted subgrade with compacted graded aggregate subbase), and also consideration for minimum lift thickness dictated by the nominal maximum size of the aggregate in the design mix. Further, the recommended minimum pavement sections are predicated upon proofrolling and compaction of the existing subgrade soils in accordance with Section 5.1.3 of this report.

MINIMUM RECOMMENDED PAVEMENT SECTIONS		
MATERIAL	**FLEXIBLE**	**RIGID**
Superpave 9.5 mm Asphaltic Concrete Surface Course	2.0 in	-
Superpave 19.0 mm Asphaltic Concrete Base Course	2.5 in	-
Portland Cement Concrete (f'_c = 4,000 psi)	-	6.0 in
Dense Graded Aggregate (DGA) Subbase	6.0 in	6.0 in

Notes:
(1) Material and installation shall conform to Pennsylvania Department of Transportation Standard Specifications for Road and Bridge Construction, unless otherwise indicated.
(2) Thicknesses indicated represent compacted material thicknesses.

The pavement sections provided above are guidelines that may or may not comply with local jurisdictional minimums. It is the responsibility of the civil/site engineer to confirm compliance with jurisdictional requirements.

4.5 Stormwater Management Areas

General: The plan provided to ECS included the test pit locations within the proposed detention basin and stormwater management (SWM) soil amendment BMP. The bottom of basin elevation was provided and is El. 136.0. Testing elevations associated with the soil amendment BMP was provided by MW Studios.

4.5.1 Infiltration Characteristics

The results of the infiltration testing are summarized in the table in the prior section of this report. We recommend design infiltration rates be proportioned based on the basin area testing that was completed. We have included some general design/construction related recommendations herein for reference.

The provided basin invert elevations generally follow existing grades. A minimum of a 2-foot buffer of suitable materials is recommended where basin subgrades are situated in rock.

ECS recommends specific construction notes appear on the plans requiring full-time observation of the excavation of the basins by the authorized ECS representative to verify suitable conditions are present. ECS can assist in developing these notes once plans become more final.

4.5.2 Stormwater Management Considerations

The property is underlain by carbonate geology which is prone to sinkhole development. The owner must understand that the concentrated influx of stormwater to a select area will increase the potential of sinkhole development. In order to reduce the rate of sinkhole development, and in keeping with the guidelines and recommendations of the PA BMP Manual, ECS recommends that the following design principles be incorporated:

- Use existing drainage patterns
- Keep stormwater away from known sinkholes or problematic subsidence areas
- Avoid concentrating stormwater
- Reduce runoff volume and velocity
- Use broad shallow basins
- Maintain the facilities post construction
- Provide underdrains or other means for dewatering in stormwater management facilities if needed

4.5.3 Stormwater Management Facilities - Design Notes

It has been our experience that construction of basins may encounter conditions that were not anticipated as a result of the subsurface exploration. As a result, we have developed the following sequence of items for addressing construction related difficulties or discrepancies with the design assumptions. We recommend that these recommendations be included in the stormwater management feature construction notes on the plans.

A. If redoximorphic features (soil mottling and coloration patterns formed by the reduction of iron and/or manganese from saturated conditions in the soil) are encountered:
   - A qualified professional should determine if the features observed are associated with a historic condition (associated with fill, previous site condition, or natural coloration) or are associated with conditions that could presently occur (seasonal variations in the water table).
   - Evaluate the elevation of the features relative to the proposed design elevation of the SWM feature and determine if the size and elevation of the SWM feature can be adjusted to alleviate the conflict.
   - Retain ECS and Civil Engineer to evaluate alternate design concepts. Alternate designs proposed by the Professional should be sealed and submitted to the Township for approval.

B. If the field verified infiltration rates are excessively high (greater than 6 inches per hour):
   - Determine the extent of the materials exhibiting the high infiltration rates through a combination of visual-manual classification, hand probing, density testing, or other suitable methods as determined by ECS.
   - Overexcavate the materials to the depth where the material type changes or a maximum depth of 2 feet, whichever is encountered first.
   - If excessive rates are associated with weathered or broken rock, the rock surface should be examined by ECS, prior to replacement of suitable material.
   - Replace the excavated material with finer grained materials approved by ECS.

C) If the field verified infiltration rates are excessively low (less than 0.1 in/hr):
   - Determine the extent of the materials exhibiting the low infiltration rates through a combination of visual-manual classification, hand probing, density testing, or other suitable methods as determined by the ECS.
   - Overexcavate the materials to the depth where the material type changes or a maximum depth of 2 feet, whichever is encountered first.
   - If bedrock is encountered, the rock should be removed to a minimum depth of 2 feet below the bottom of basin and should be examined by ECS, prior to replacement of suitable material.
   - Replace the excavated material with more coarsely grained materials approved by ECS. Suitable soil mixtures can consist of a blend of on-site and/or off-site materials available to the Contractor, and subject to testing and approval of ECS.
   - Suitable soil mixtures may consist of materials blended by volume ratios as determined by ECS.
   - Materials should be lightly tracked into place in non-structural areas.

If material replacement is required in structural areas (Ex: below-grade SWM facilities in paved areas), material placement specifications, including materials type, mix ratio, compactive effort and required density should be determined by ECS.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 Karst Considerations

If subsidence features such as sinkholes, surface depressions, and exposed rock pinnacles are encountered, ECS must be consulted to provide a recommendation for repair on a case-by-case basis.

Although sinkholes stem from geologic conditions within the underlying rock, they are often triggered by changes in the surface and subsurface drainage patterns. In order to reduce the potential for future sinkhole development which could impact foundation performance, positive surface drainage should be maintained both during and after construction. ECS recommends that the following preventative measures be followed to reduce the potential inducement of sinkhole formation in proposed development areas and to incorporate good construction practices:

1. Earthwork operations should be graded to drain away from structures. Upon completion of daily earthwork operations, the ground surface should be sealed by thorough rolling to reduce infiltration of precipitation and facilitate runoff.

2. Sediment control management facilities should be located outside of planned construction areas. Inlets associated with storm drain systems should not be utilized as temporary sediment control devices during construction.

3. During construction, care should be taken to reduce the ponding of surface water in and/or adjacent to buildings.

4. Visual observations during earthwork operations should be carried out in order to detect any previous unexposed or recently created collapse features. Any such feature should be called to the ECS's attention for remedial improvement.

5. Final site grading should include sloping grades and piping of downspouts away from buildings.

6. Storm piping should be designed such that joints and structure tie-ins remain watertight with allowance for some settlement. Leaking storm pipes promote subsurface seepage and can instigate sinkhole development in the form of surficial dropouts with little or no warning. It may be beneficial to use bentonite clay around pipe joints to reduce the potential for long-term leaking.

Areas identified to be suspect during the initial earthwork phase should be further explored during construction to determine the extent, both vertically and horizontally, of possible solution activity. We recommend that available geotechnical data be made available to ECS during earthwork operations.

If a sinkhole develops at the project site, ECS can provide observation, documentation, and recommendations for repair. Due to the karst nature of the project site, proper repair is imperative. Typical sinkhole repair details are included in Appendix D

5.2 Subgrade Preparation

5.2.1 Demolition

Prior to general earthwork and construction, demolition and off-site disposal any remaining below-grade foundation elements and construction debris from past site development within the construction

footprint is required. Existing below-grade foundation elements must be removed to a depth of at least 3 feet below the proposed subgrade elevation for the new construction, and in their entirety where they conflict with planned foundations and slabs. Hoe-rams or specialized demolition equipment may be required to dislodge and remove such buried obstructions. Existing utilities should be removed from, and relocated around, new structures. Excavations associated with removal of these items extending below the level of proposed subgrade should be backfilled with Structural Fill as specified herein. Demolition debris must be disposed of off-site in accordance with local, State, and Federal regulations.

5.2.2 Stripping and Grubbing

Subgrade preparation should consist of removing all vegetation, trees, stumps, roots, topsoil, existing fill, pavements, debris and any soft or unsuitable materials within the limits of planned construction. Based upon the observations within the completed explorations, removal of topsoil should be anticipated within some areas. Deeper topsoil or organic-rich soils may be present in wet, low-lying, poorly drained areas and densely wooded areas. ECS should be retained to document that topsoil and other unsuitable near-surface materials have been stripped prior to excavation to construct subgrade elevations, placement of Structural Fill, and construction of new earthworks and structures.

5.2.3 Proofrolling

Prior to subgrade compaction, fill placement or other construction on subgrades, the subgrades should be evaluated by ECS. Unless otherwise recommended herein, the exposed subgrade should be thoroughly proof rolled with construction equipment having a minimum axle load of 10 tons (e.g., fully loaded tandem-axle, on-road dump truck) travelling at a maximum of 1.5 feet per second (approximately 1 mile per hour). Proof rolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of ECS. This procedure is intended to assist in identifying any localized yielding materials.

Where proof rolling identifies areas that are unstable or “pumping” subgrade or has experienced permanent deformation more than 1/2-inch, those areas should be remediated prior to the subsequent compaction and placement of engineered fill or other construction materials. Remediate by undercutting and replacing the unstable/unsuitable soils in these area with compacted Structural Fill as described herein. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of potentially unstable materials and delineate the extent of undercutting needed.

5.2.4 Potential Undercuts

As previously stated, undercutting and replacement is not anticipated; however, where observed or otherwise identified (e.g., proof rolling, subsurface exploration logs, dynamic cone penetrometer testing), unsuitable soils must be undercut and removed. It is important to have ECS observe, probe, and test subgrade conditions prior to placing foundation concrete to document the bearing soils are what was anticipated and the extent of undercutting necessary, if any.

Undercuts should be backfilled with Structural Fill up to the original design subgrade elevation required. Open-graded gravel (e.g., AASHTO No. 57) should not be used to backfill foundation undercuts as this could result in a reservoir condition, allowing the accumulation of water and potential softening of the bearing soils. It is important to have ECS observe subgrade conditions prior to placing foundation concrete or Granular Capillary Break/Drainage Layer for ground-supported slabs to document the bearing soils are what was anticipated and the extent of undercutting necessary, if any. Some undercutting and replacement should be anticipated within the new building footprint.

5.2.5 Site Temporary Dewatering

The contractor must make its own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil sampling is not continuous, and thus soil and groundwater conditions may vary between sampling intervals. If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to determine dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the succinct geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade and pavements, etc. Water discharged from any site dewatering system must be discharged in accordance with all local, State, and Federal requirements.

We anticipate that effective, short-term dewatering operations can be managed by using trash pumps or conventional submersible pumps directly in open excavations for the construction of the shallow foundations.

5.3 Earthwork Operations

5.3.1 Weathered Rock and Rock

Based on boring data obtained during the exploration, we anticipate materials requiring difficult or rock excavation techniques will be encountered during excavation to planned subgrades for the proposed hotel foundation elements.

The excavation of weathered rock and rock can have a substantial impact on the cost and schedule of the proposed construction. This discussion considers two general classes of materials for purposes of describing excavatability. Residuum and weathered rock will be used as the terms for the materials to be excavated.

In mass excavations for general site work, overburden soils with standard penetration test N-values of 50 bpf or less can usually be removed with conventional earth excavation equipment. Residual soils or soft weathered (Saprolitic) rock with N-values of 50 to 100 bpf can generally be removed with conventional earth moving equipment after first being loosened with a large single-tooth ripper attached to a large crawler tractor. Harder, less weathered rock will generally require the use of a large single-tooth ripper, dozers, and/or track-mounted backhoes for excavation. However, materials exhibiting N-values of 100 blows for 1 inch of penetration, typically defined as refusal material, will be more difficult to excavate and generally require blasting and other rock excavation techniques. The actual excavatability of the bedrock material will be greatly controlled by in-situ jointing and bedding and may vary from location to location. In confined excavations, such as utility trenches, excavation of dense residual soils typically requires the use of large track-mounted backhoes. Excavation of harder phases of weathered rock typically requires the use of large track-mounted backhoes, pneumatic spades, or light blasting. Refusal materials (apparent rock) normally require blasting in trench excavations. Blasting in utility trenches should be done carefully

to avoid damage to the surrounding materials. When the material to be excavated requires blasting, the contractor should comply with the requirements of Pennsylvania DEP.

5.3.2 Structural Fill

Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of the off-site borrow should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are dated within 90 days of the submission date.

Satisfactory Structural Fill Materials: Materials satisfactory for use as Structural Fill must be free of deleterious materials such as construction debris, wood, glass, ash, trash, refuse, roots and other organic matter; and conform to the following engineering properties and compaction requirements. Additionally, imported materials for use as Structural Fill must also meet the Pennsylvania Department of Environmental Protection's Requirements for Soil and Fill Materials.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	**Property**
Liquid Limit	< 40
Plasticity Index	< 20
Maximum Particle Size	3 inches
Fines Content (percent passing the No. 200)	15% maximum
Maximum Organic Content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Modified Proctor, ASTM D1557
Required Compaction	95% of Maximum Dry Density
Moisture Content	within -2 to +3 percentage points of optimum
Loose Lift Thickness	8 inches

Fill Placement: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned. Field testing in accordance with ASTM D6938 using the representative results from ASTM D1557 is recommended at a per lift frequency of not less than one (1) test per 1,500 square feet or a minimum of two (2) tests per lift, whichever more frequent, within the planned building footprint and not less than one (1) test per 2,500 square feet in pavement areas.

5.3.3 On-site Soil Re-use

Existing on-site, granular soils consisting of inorganic soils classified as USCS: SM, SC, SW, SP, GW, GP, GM and GC, or a combination of these group symbols, per ASTM D2487, resulting from excavations for foundations may be re-used. The materials should be suitably dry; free of organic matter, debris, and

other deleterious material; and should contain no particle sizes greater than 4 inches in the largest dimension.

Prior to re-use of on-site soils, representative bulk samples (about 50 pounds) of the material should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, particle-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. The compaction requirements for on-site soil re-use will be the same as those outlined for the Structural Fill.

5.3.4 Conventional Excavation Considerations

All excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations (both sides and bottom of the excavations) and slopes. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, State, and Federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

5.4 Earthwork and Foundation Observations

Subgrade and Engineered Fill: It is important to have ECS observe proofrolling and test subgrade compaction prior to engineered fill placement to document the soil conditions and the extent of any undercutting necessary. Additionally, it is important to have ECS observe, test, and document the as-placed moisture content and density of engineered fill on a full-time, lift-by-lift basis for conformance with our recommendations.

Footing Subgrade: To ensure the soils at or below footing bearing elevations are to be suitable for support of the new building, it is important to have ECS observe, probe, and test the footing subgrade prior to placing foundation concrete to document the bearing soils are what was anticipated and the extent of undercutting necessary.

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at design subgrade elevation if the excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the subgrade is exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the subgrade soils before the placement of reinforcing steel.

Foundation Installation: Foundation installation should be observed on a full-time basis by the Geotechnical Engineer or a qualified testing agency to determine actual undercut depths.

5.5 Utility Installations

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes and conduits. The subgrade for utility excavations should be observed and probed for stability by ECS. Any soft/loose or unsuitable materials encountered at the subgrade elevation should be removed and replaced with suitable compacted Structural Fill or bedding material.

Utility Backfilling: We recommend granular bedding material (e.g., AASHTO No. 57) be at least 4 inches thick, but not less than that specified by the civil/site engineer's project drawings and specifications. Bedding material should be placed up to at least the springline of the pipe unless otherwise required by civil/site engineer, pipe manufacturer, or documented industry standard. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill.

Utility Excavation Dewatering: It is possible that water may be encountered within utility excavations which extend below existing grades. It is anticipated that removal of water which seeps into utility excavations can be accomplished by pumping from sumps excavated into the trench bottom. Should water conditions beyond the capability of sump pumping be encountered, the contractor should prepare and submit a Dewatering Plan.

6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by MW Studios. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report

Appendix A - Drawings and Reports

Site Location Diagram
Boring Location Diagram(s)
Subsurface Cross-Section(s)
Geologic/Soil Survey Maps

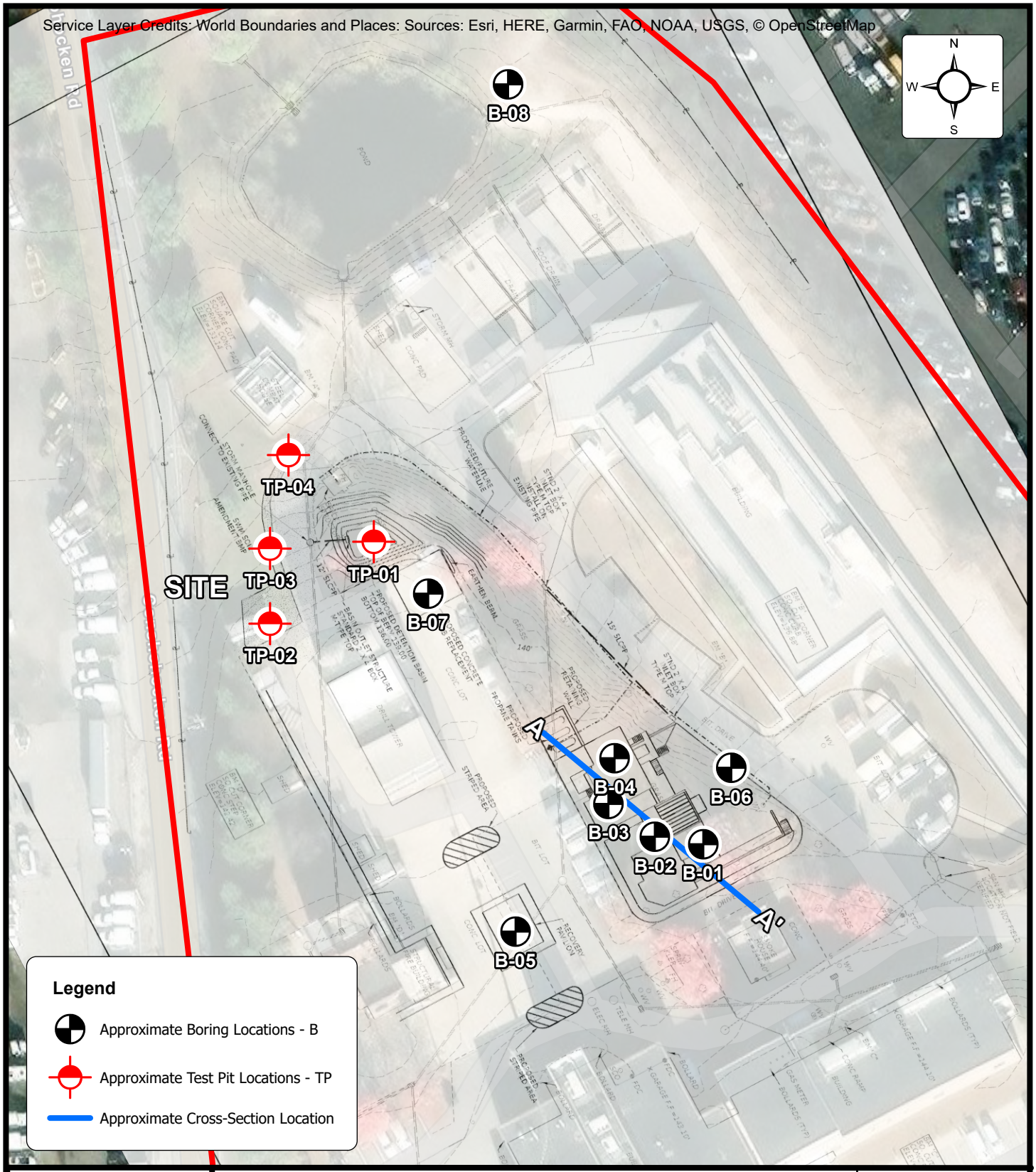


SITE LOCATION DIAGRAM
Montgomery Co. Fire Training Building

1175 Conshohoken Road
Conshohoken, Pennsylvania

MW Studios

ENGINEER	JCY
SCALE	1" = 500'
PROJECT NO.	44:2244
SHEET	
DATE	3/13/2025



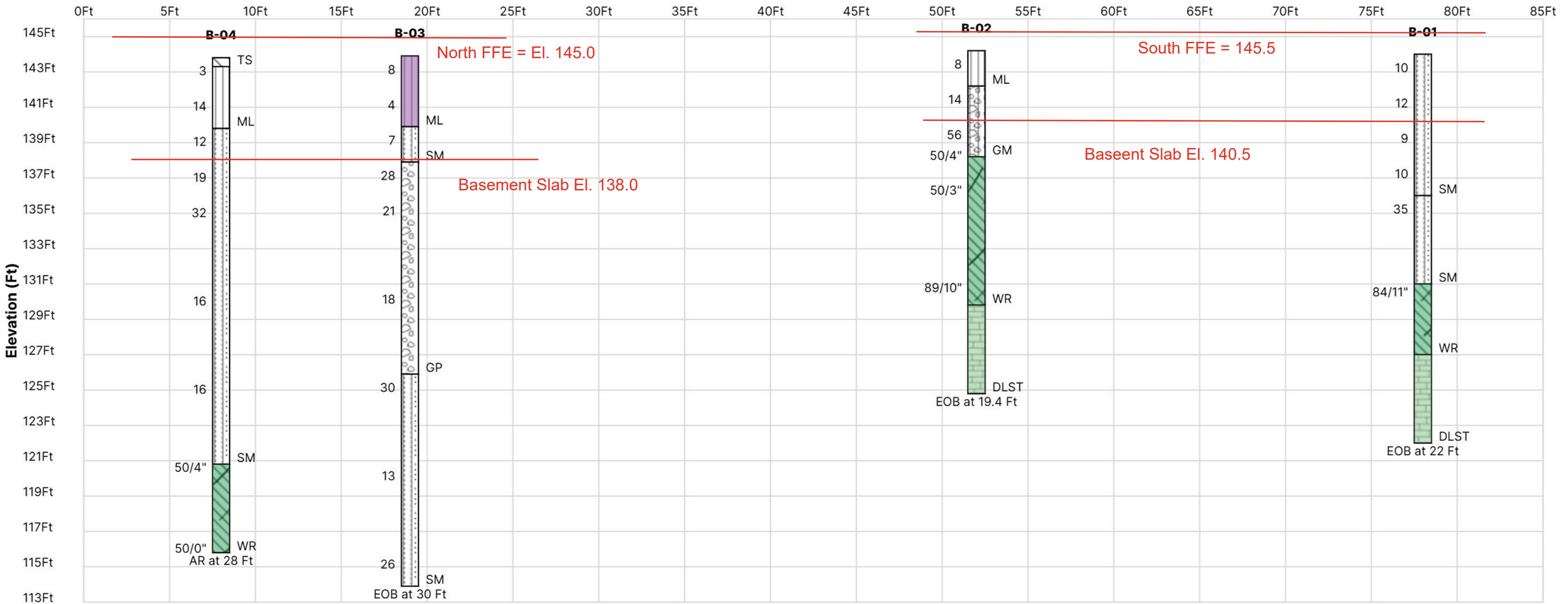
EXPLORATION LOCATION DIAGRAM
Montgomery Co. Fire Training Building

1175 Conshohoken Road
Conshohoken, Pennsylvania

MW Studios

ENGINEER	JCY
SCALE	1" = 80'
PROJECT NO.	44:2244
SHEET	
DATE	3/13/2026

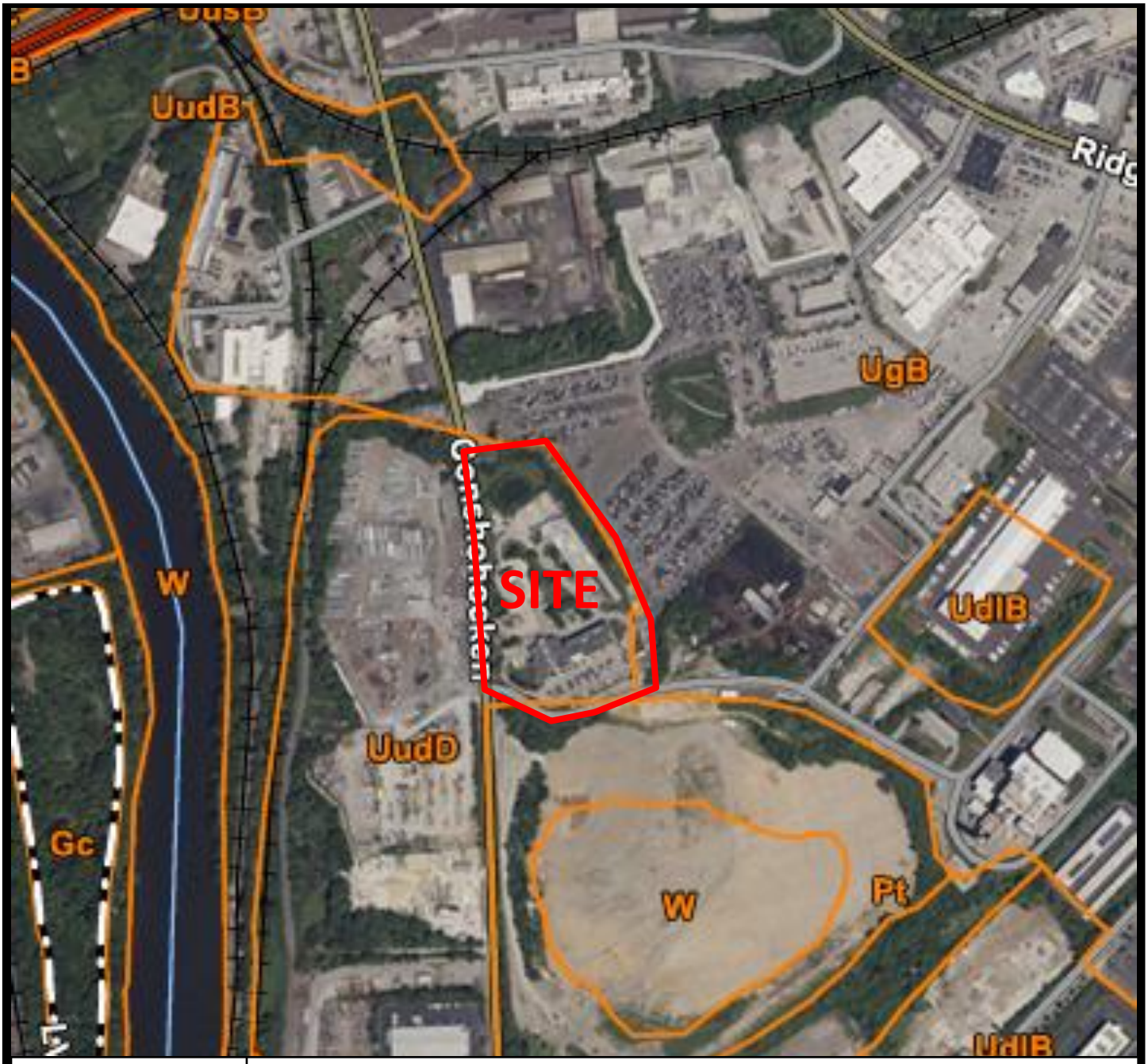
Generalized Subsurface Cross Section A-A'



CLIENT:	MW Studios	PROJECT:	Montgomery Co. Fire Training Building
DRAWN DATE:	Mar 16, 2026	PROJECT NO.:	44:2244
CHECKED DATE:	Mar 16, 2026	SCALE:	AS SHOWN

Notes:
1-EOB: END OF BORING AR: AUGER REFUSALSR: SAMPLER REFUSAL
2-SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
3-STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).
4- TOPOGRAPHIC INFORMATION IS BASED ON PUBLICLY AVAILABLE DATA (GOOGLE OR CESIUM).THE TOPOGRAPHIC LINE SHOWN BETWEEN BORINGS IS FOR VISUAL REFERENCE ONLY.PLEASE REFER TO THE REFERENCE NOTES FOR BORING LOGS FOR SYMBOLOGY MEANING AND ADDITIONAL

Plastic Limit Water Content Liquid Limit X——●——△		WL (First Encountered)	Fill
[FINES CONTENT %]		WL (Completion)	Possible Fill
BOTTOM OF CASING		WL (Estimated Seasonal High Water)	Probable Fill
100% LOSS OF CIRCULATION		WL (Stabilized)	WR/Rock
CALIBRATED PENETROMETER			



Map Unit Symbol	Map Unit Name
UudD	Urban land-Udorthents, limestone complex, 8 to 25 percent slopes
UgB	Urban land, 0 to 8 percent slopes
Pt	Pits, quarry

Source: Web Soil Survey

NORTH

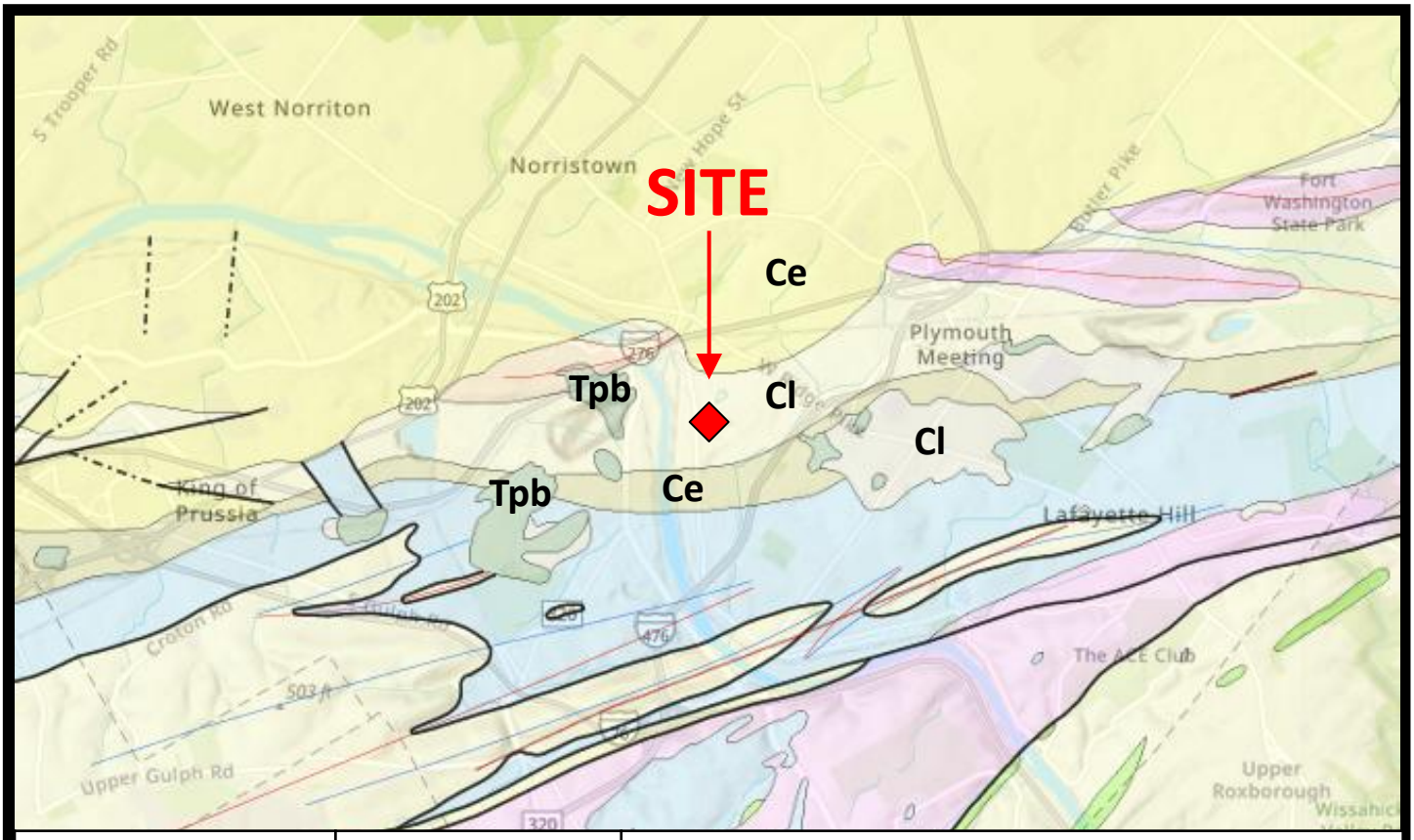
Montgomery County Fire Training Building

1175 Conshohoken Road
Conshohoken, Pennsylvania

MW Studios

SOIL SURVEY MAP

ECS Project 44:2244
March 13, 2025



Bedrock Geology Name (Abbreviation)	Main Rock Type	Notes
Ledger Formation (Cl)	Dolomite	The Ledger Formation is a light-gray, locally mottled, massive, pure, coarsely crystalline dolomite that is siliceous in the middle part. The beds, which are moderately well developed and massive, weather to rust-stained, granular, cherty layers. It is approximately 2,000 feet thick (Geyer and Wilshusen, 1982).
Pensauken and Bridgeton Formations, undifferentiated (Tpb)	Feldspathic quartz sand	The Pensauken Formation overlies the Bridgeton Formation. It consists of yellow to dark-reddish-brown, cemented, extensively crossbedded, feldspathic quartz sand with interbedded coarse gravel and boulders up to 5 feet in size. Its maximum thickness is at least 30 feet. The Bridgeton Formation occurs as remnants of a terrace at an altitude of between 10 and 175 feet above sea level. It is composed of extensively crossbedded, clayey, feldspathic quartz sand stained reddish brown at its top. Below the reddened zone, the sand is either yellow or white. Beds of gravel are locally present. Its maximum thickness is about 30 feet (Geyer and Wilshusen, 1982).
Elbrook Formation (Ce)	Calcareous shale	The Elbrook Formation consists of light-gray to yellowish-gray, finely laminated siliceous limestone having interbeds of dolomite, calcareous shale, and silty limestone. It is cherty and well bedded. The beds are mostly thick, but flaggy and massive beds also occur. It is about 3,000 feet thick (Geyer and Wilshusen, 1982).

Source: PaGEODE – Pennsylvania GEOlogic Data Exploration

NORTH

Montgomery County Fire Training Building

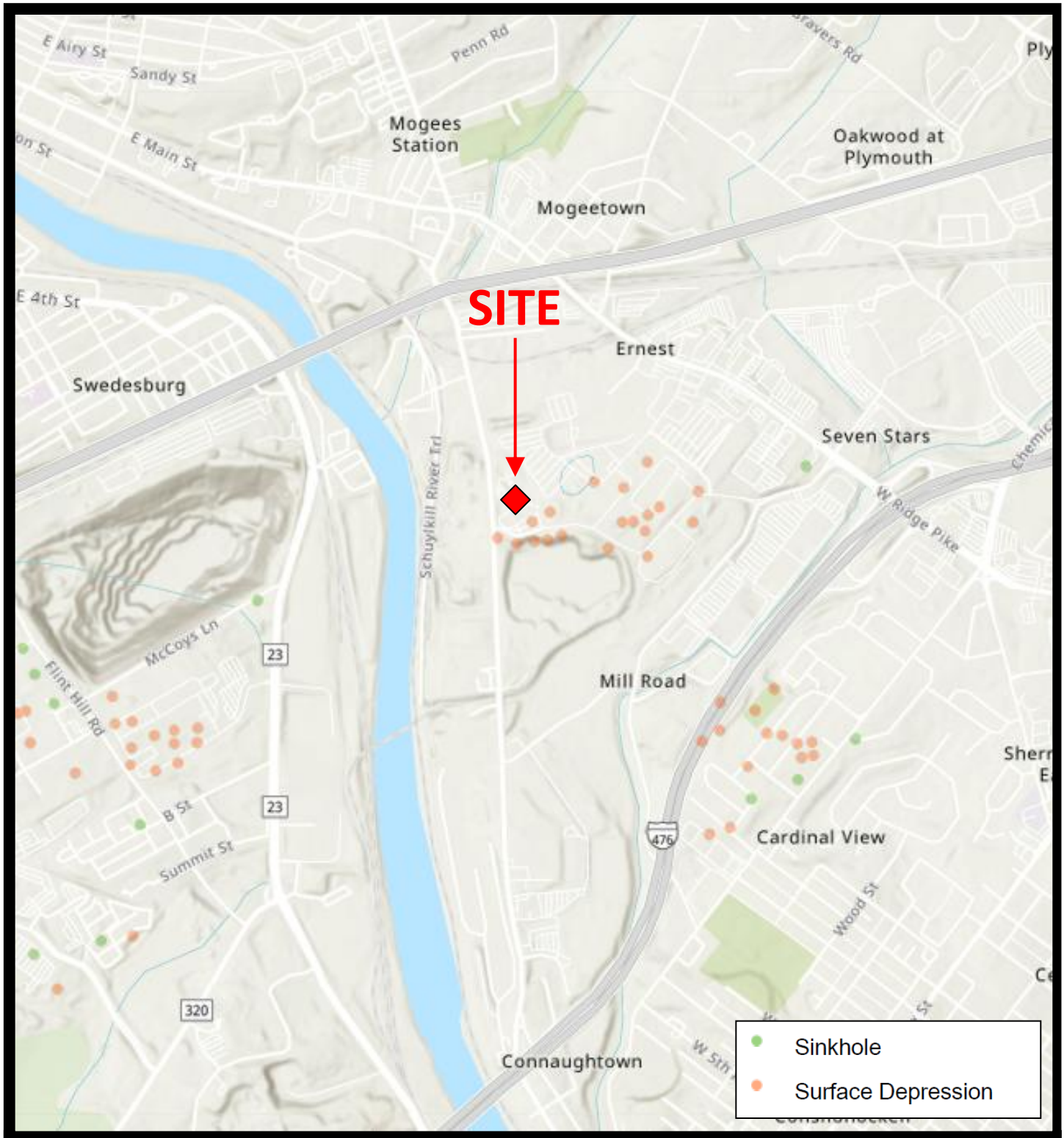
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BEDROCK GEOLOGY MAP

ECS Project 44:2244
March 13, 2025



Source: PaGEODE – Pennsylvania GEOlogic Data Exploration

NORTH

Montgomery County Fire Training Building

1175 Conshohoken Road
Conshohoken, Pennsylvania

MW Studios

KARST FEATURES MAP

ECS Project 44:2244
March 13, 2025

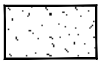
Appendix B - Field Operations

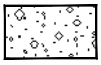
Reference Notes
Exploration Procedures
Boring Logs
Test Pit Logs
Photographs
Infiltration/Permeability/Hydraulic Test Results

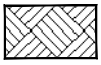
REFERENCE NOTES FOR BORING LOGS

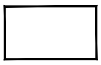
MATERIAL[1,2]

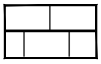

ASPHALT


CONCRETE


GRAVEL

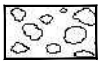

TOPSOIL

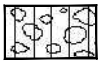

VOID


BRICK

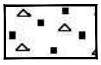

AGGREGATE BASE COURSE

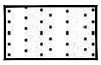

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

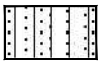

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

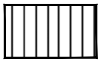

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

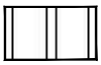

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

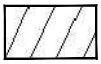

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

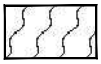

SC **CLAYEY SAND**
sand-clay mixtures

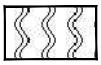

ML **SILT**
non-plastic to medium plasticity

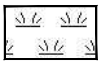

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

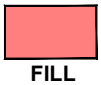

WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK


FILL


POSSIBLE FILL


PROBABLE FILL


ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

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REFERENCE NOTES FOR ROCK CORES

ROCK CLASSIFICATION TYPES		
Igneous	**Sedimentary**	**Metamorphic**
Coarse Grained	**Clastic (sediment)**	**Foliated**
DIABASE	SHALE	GNEISS
DIORITE	SILTSTONE	PHYLLITE
GABBRO	SANDSTONE	SCHIST
GRANITE	CONGLOMERATE	SLATE
PEGMATITE	LIMESTONE, OOLITIC	**Non-Foliated**
PERIDOTITE	**Chemically Formed**	AMPHIBOLITE
SYENITE	DOLOSTONE	HORNFELS
Fine Grained	GYPSUM	MARBLE
ANDESITE	HALITE	QUARTZITE
BASALT	LIMESTONE	
RHYOLITE	**Organic Remains**	
TRACHYTE	CHALK	
Pyroclastic	COAL	
OBSIDIAN	COQUINA	
PUMICE		
TUFF		

HARDNESS	
Very Soft	Deformed by hand
Soft	Scratched with a fingernail
Moderately Hard	Scratched easily with a knife
Hard	Scratched with difficulty with a knife
Very Hard	Cannot be scratched with a knife

JOINT/FRACTURE SPACING	
Fractured/Jointed	**Spacing**
Very Widely	> 10 feet
Slightly	3 - 10 feet
Moderately	1 - 3 feet
Highly	2 inches - 1 foot
Intensely	< 2 inches

BEDDING	
Thinly	≤ 0.3 ft.
Medium	>0.3 ft. ≤ 1 ft.
Thickly	>1 ft. ≤ 3 ft.
Massive	>3 ft.

JOINT OR FRACTURE CONTINUITY

It shall be noted whether the joints or fractures are continuous or discontinuous. If continuity of joints is not discernable at the scale of the rock core, continuous joints or fractures shall be assumed.

JOINT/FRACTURE ORIENTATION

The range or average orientation of each joint set or fracture trend shall be measured in degrees from a horizontal plane where possible. If no measurement is possible, the qualitative terms High, Moderate or Low-angle shall be used. Record whether the joints are present in Conjugate sets (i.e. having an opposite sense of dip)

High	61-90 degree
Moderate	31-60 degree
Low-angle	0-30 degree
Dip-angle	(1-90) ____ degrees (if measured)

Recovery (REC(%))

$$\frac{\text{Total rock recovered from run}}{\text{Total Run Length}}$$

Rock Quality Designation (RQD(%))*

$$\frac{\text{Sum of core pieces} \geq 4 \text{ inches long}}{\text{Total Run Length}}$$

RQD%	Description of Rock Quality
0-25%	Very Poor
>25%-50%	Poor
>50%-75%	Fair
>75%-90%	Good
>90%	Excellent

WEATHERING	
Unweathered	No evidence of any chemical or mechanical alteration.
Slightly Weathered	Slight discoloration on surface, slight alteration along discontinuities, less than 10 percent of the rock volume altered.
Moderately Weathered	Discoloring evident, surface pitted and altered with alteration penetrating well below rock surfaces, weathering 'halos' evident. 10 to 50 percent of the rock altered.
Highly Weathered	Entire mass discolored, alteration pervading nearly all of the rock, with some pockets of slightly weathered rock noticeable, some minerals leached away.
Decomposed	Rock reduced to a soil with relict rock structure remaining (i.e. saprolite). Generally molded and crumbled by hand (friable).

JOINT/FRACTURE SURFACE CONDITION

The following qualitative terms shall be used to describe surface condition of joints and fractures. Multiple terms can be used.

Very rough	Slightly rough	Slickensided	Gouge

WALL ROCK CONDITION

The qualitative terms 'hard wall rock' or 'soft wall rock' shall be used to describe the condition of the parent rock on either side of the joint or fracture.

Description Sequence	Example Rock Classification Description
ROCK TYPE, [REC=_%,RQD=_%], Weathering, Hardness, Bedding, Joint/Fracture Spacing, Joint/Fracture Surface Condition, Wall Rock Condition, Joint or Fracture Continuity, Joint/Fracture Orientation, Color, Additional Features	LIMESTONE, [REC=95%,RQD=60%], Highly Weathered, Hard, Thinly Bedded, Slightly Fractured/Jointed, Slightly Rough, Hard Wall Rock, Continuous, Moderate-angle Dip, Gray White

*ASTM D6032-17: RQD is performed on cores using BQ to PQ sized bits (1.433 to 3.345 inch diameter cores, respectively)

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SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)



- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.



**Drilling Methods May Vary*— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

SUBSURFACE EXPLORATION PROCEDURE: TEST PIT EXCAVATION

A test pit is an excavation of subsurface materials to characterize the composition and rippability/excavation efforts. Test pit exploration allows observation of the boundary relationships within a soil and rock profile and is useful to identify existing fill composition, disturbed material or the depth of soft sediments. Both track mounted excavators and backhoes are used in a variety of ground conditions allowing for difficult terrain to be accessed. The excavation process also provides access for in-situ and field testing and acquisition of samples for laboratory testing.

TEST PIT Procedure:

- Involves excavation subsurface material to observe composition and physical characteristics
- Recording the approximate depth of subsurface strata
- Excavation is continued as prescribed or to limits of equipment and subsurface conditions
- The exploration is typically carried out with an excavator or backhoe, with the depth dependent on machine size and ground



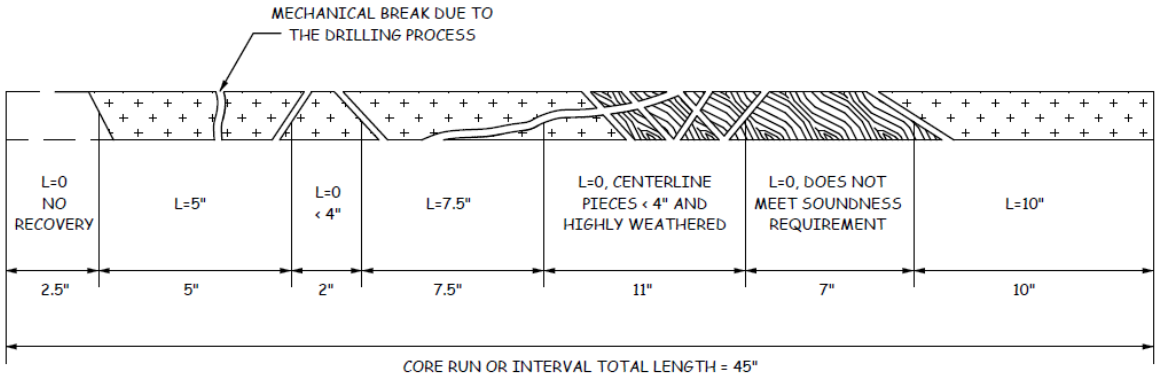


SUBSURFACE EXPLORATION PROCEDURE: ROCK CORE DRILLING AND SAMPLING ASTM D 2113

Rock core drilling is a method to obtain bedrock cores for geological data and to provide information about the engineering properties of rock formations at the drilled locations. Rock coring provides samples for characterization purposes, as well as a measure of the Recovery and Rock Quality Designation, or RQD, and various engineering laboratory tests. The geologic engineering properties determined from rock cores are advantageous in the design of geotechnical elements such as foundations.

Rock Core Procedure:

- Soil test borings are advanced through the soil medium to auger refusal, which is generally considered the top of rock.
- Rock coring is accomplished with a diamond studded rock core barrel attached to a drill rig and utilized for sampling during the rotation and advancement of the hollow barrel.
- Rock recovery (REC) is the percentage of the total length of rock recovered divided by the length of the core run.
- The Rock Quality Designation (RQD) is generally the percentage of the total length of the rock pieces 4-inches in length or greater divided by the length of the rock core run.



$$REC\% = \frac{\text{TOTAL ROCK RECOVERED}}{\text{CORE RUN TOTAL LENGTH}} \times 100 = \frac{5"+2"+7.5"+11"+7"+10"}{45"} \times 100 = \frac{42.5"}{45"} \times 100 = 94\%$$

$$RQD\% = \frac{\text{TOTAL SOUND CORE PIECES >4"}}{\text{CORE RUN TOTAL LENGTH}} = \frac{5"+7.5"+10"}{45"} = \frac{22.5"}{45"} \times 100 = 50\%$$

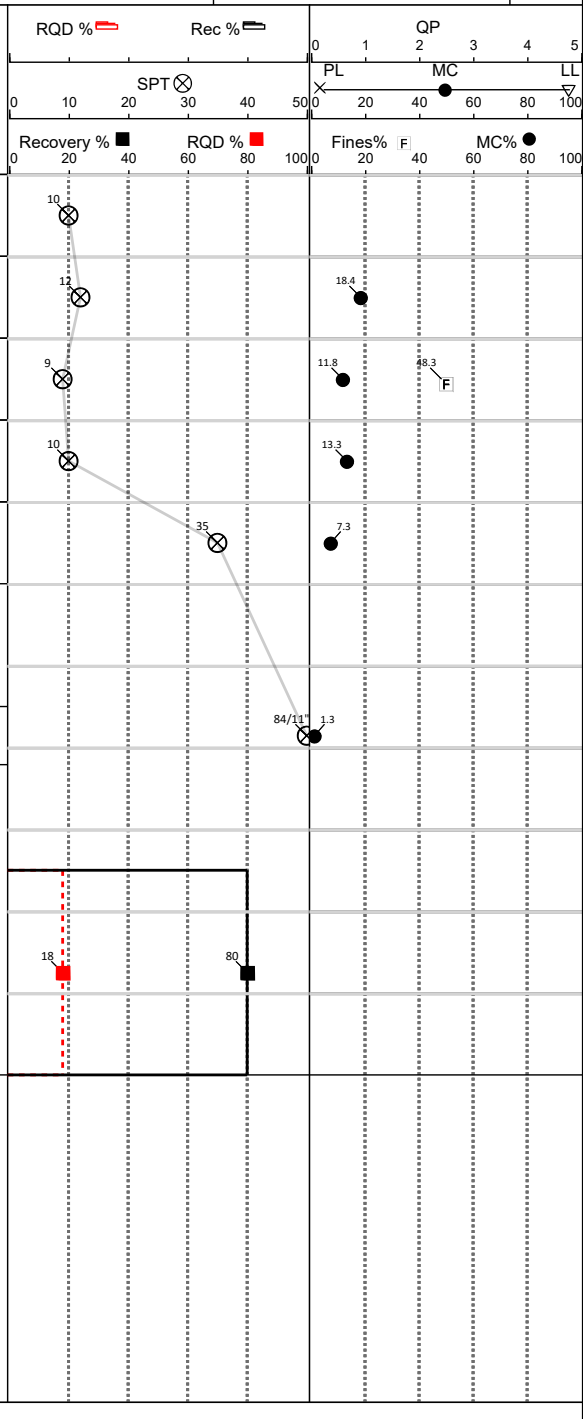
RQD (ROCK QUALITY DESIGNATION)	CLASSIFICATION OF ROCK QUALITY
0 - 25%	VERY POOR
>25 - 50%	POOR
>50 - 75%	FAIR
>75 - 90%	GOOD
>90 - 100%	EXCELLENT

LEGEND  SOUND ROCK  UNSOUND ROCK

NOTE: DIAGRAM ADAPTED FROM ASTM D6032/6032M-17

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-01**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.09827563**	LONGITUDE: **-75.31609883**	STRUCTURE:	SURFACE ELEVATION: **144**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	24	12	(SM) SILTY SAND WITH GRAVEL - light orangish brown, moist, loose to medium dense.				4-6-4-6 (10)
	S-2	SS	24	18					4-6-6-22 (12)
5.0	S-3	SS	24	18				140	2-2-7-8 (9)
	S-4	SS	24	12					4-5-5-9 (10)
	S-5	SS	24	24	(SM) SILTY SAND WITH GRAVEL - light orangish brown , light brown, moist, dense.			135	10-17-18-21 (35)
10.0									
	S-6	SS	17	17	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND WITH GRAVEL - light orangish brown , light brown, moist, very dense.			130	13-34-50/5" (84/11")
15.0									
20.0	R-1	RC	60	48	DOLOSTONE, [REC=80%, RQD =18%], slightly weathered, Hard, Massive bedded, Highly to Intensely Fractured/Jointed, Very rough to Slightly rough, Hard wall rock, Continuous, Moderate Dip, White.			125	
					END OF BORING at 22.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	**Dry**	**BORING STARTED:**	**02/19/2026**	**CAVE IN DEPTH:**	**Not Observed**
WL (Completion):	**Water added for RC**	**BORING COMPLETED:**	**02/19/2026**	**HAMMER TYPE:**	**Automatic**
WL (Seasonal High Water):		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
WL (Stabilized):		**Acker Rebel**	**JT**	**Hollow Stem Auger (0'-17'), Rock Coring (17'-22')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-02**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.098289**	LONGITUDE: **-75.31619954**	STRUCTURE:	SURFACE ELEVATION: **144.2**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	24	8	(ML) SANDY SILT - brown, moist, loose.				2-4-4-4 (8)
	S-2	SS	24	14	(GM) SILTY GRAVEL WITH SAND - light brown , gray, moist, medium dense to very dense.				4-8-6-8 (14)
5.0	S-3	SS	24	20				140	9-28-28-35 (56)
	S-4	SS	4	2	(WR) WEATHERED ROCK SAMPLED AS SILTY GRAVEL WITH SAND - light brown , gray, moist, very dense.				50/4" (50/4")
	S-5	SS	3	1				135	50/3" (50/3")
10.0									
	S-6	SS	16	16					28-39-50/4" (89/10")
15.0	R-1	RC	60	16.8	DOLOSTONE, [REC=28%, RQD =18%], moderately weathered, Hard, Massive bedded, Highly to Intensely Fractured/Jointed, Very rough to Slightly rough, Hard wall rock, Continuous, Moderate Dip, White.			130	
								125	
					END OF BORING at 19.4 FT				

RQD % Rec % SPT
Recovery % RQD %
QP PL MC LL
Fines% F MC%

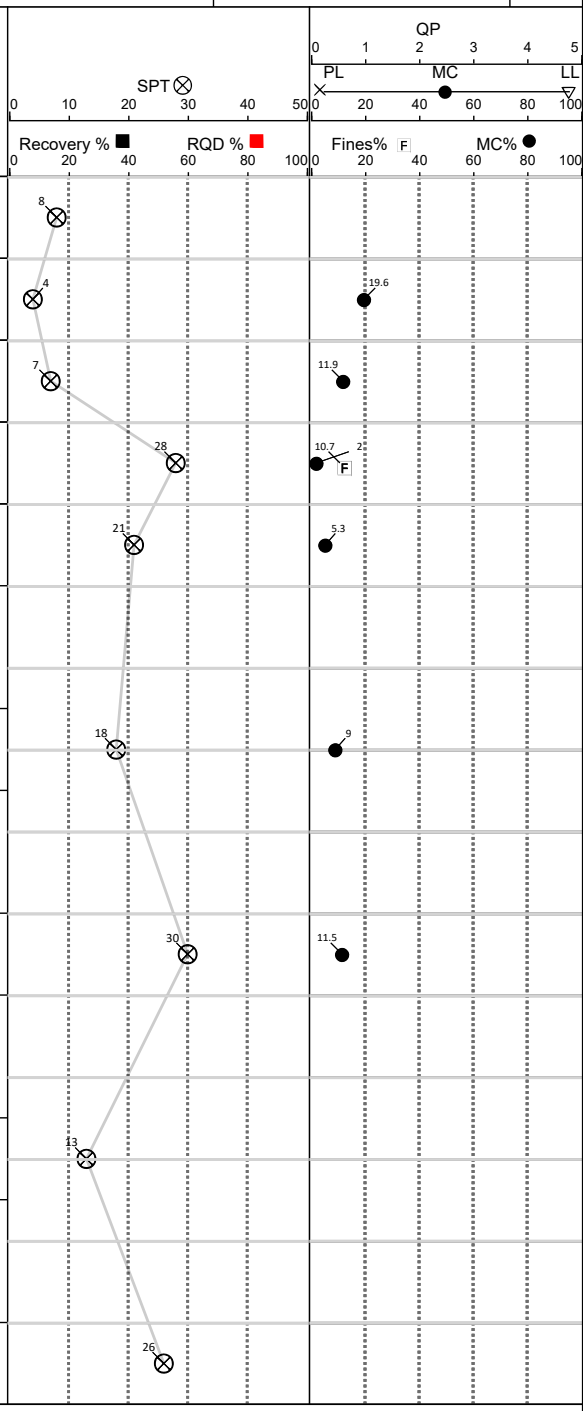
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	**Dry**	**BORING STARTED:**	**02/19/2026**	**CAVE IN DEPTH:**	**Not Observed**
WL (Completion):	**Water added for RC**	**BORING COMPLETED:**	**02/19/2026**	**HAMMER TYPE:**	**Automatic**
WL (Seasonal High Water):		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
WL (Stabilized):		**Acker Rebel**	**JT**	**Hollow Stem Auger (0'-14.4'), Rock Coring (14.4'-19.4')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-03**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.09834469**	LONGITUDE: **-75.316294**	STRUCTURE:	SURFACE ELEVATION: **143.9**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	24	22	POSSIBLE FILL - (ML) SANDY SILT - trace gravel, dark brown, moist, very loose to loose.		WoH-2-6-6 (8)
	S-2	SS	24	6			2-2-2-2 (4)
5.0	S-3	SS	24	20	(SM) SILTY SAND - brown, moist, loose.	140	2-3-4-4 (7)
	S-4	SS	24	10	(GP) POORLY GRADED GRAVEL WITH SAND - light brown, moist, medium dense.		10-12-16-16 (28)
	S-5	SS	24	6		135	10-12-9-14 (21)
10.0							
	S-6	SS	24	8		130	5-10-8-7 (18)
15.0							
	S-7	SS	24	15	(SM) SILTY SAND WITH GRAVEL - light brown , orangish brown, moist, medium dense.	125	11-16-14-14 (30)
20.0							
	S-8	SS	24	12		120	5-6-7-8 (13)
25.0							
	S-9	SS	24	18	**END OF BORING at 30.0 FT**	115	13-15-11-11 (26)



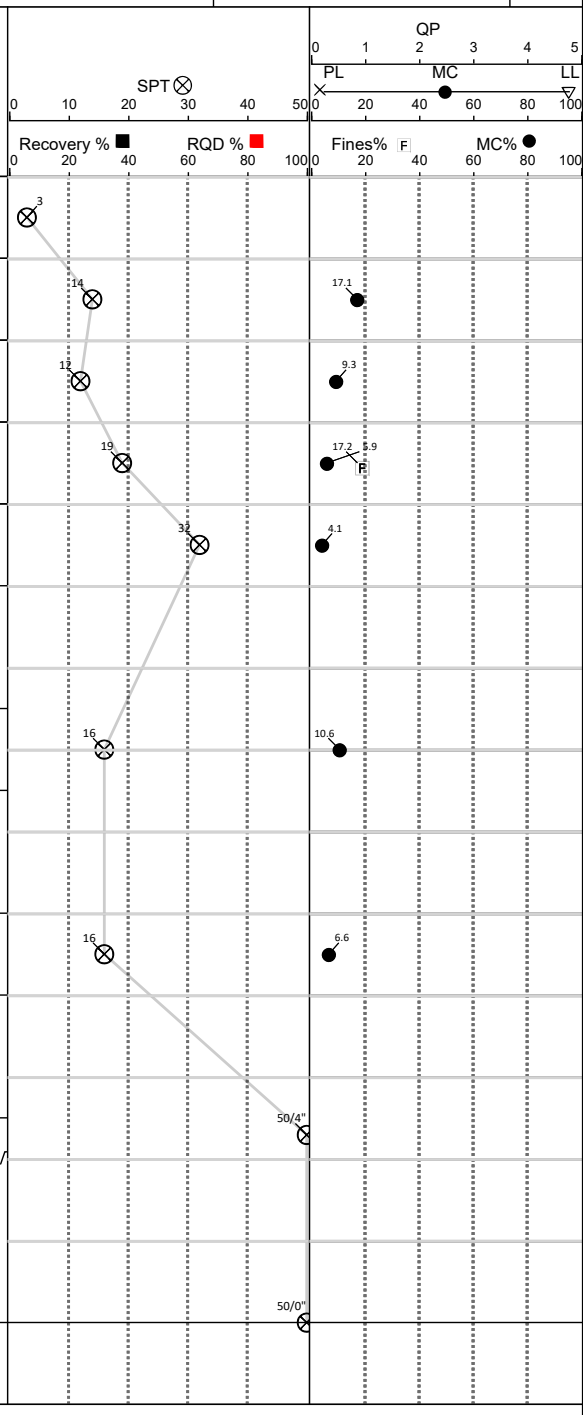
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	Dry	BORING STARTED:	02/19/2026	CAVE IN DEPTH:	Not Observed
WL (Completion):	Dry	BORING COMPLETED:	02/19/2026	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	Hollow Stem Auger (0'-30')
WL (Stabilized):		Acker Rebel	JT		

GEOTECHNICAL BOREHOLE LOG

CLIENT: **MW Studios**	PROJECT NO.: **44:2244**	BORING NO.: **B-04**	SHEET: **1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.0984175**	LONGITUDE: **-75.31627865**	STRUCTURE:	SURFACE ELEVATION: **143.8**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	24	18	Topsoil [Thickness=6"]. (ML) SANDY SILT - brown, moist, very loose to medium dense.				WoH-1-2-2 (3)
	S-2	SS	24	22					4-7-7-7 (14)
5.0	S-3	SS	24	17	(SM) SILTY SAND WITH GRAVEL - light brown , dark orangish brown, moist, medium dense to very dense.			140	5-6-6-7 (12)
	S-4	SS	24	19					5-7-12-10 (19)
	S-5	SS	24	24				135	11-14-18-19 (32)
10.0									
	S-6	SS	24	24				130	7-8-8-8 (16)
15.0									
	S-7	SS	24	2				125	6-7-9-11 (16)
20.0									
	S-8	SS	10	3	(WR) WEATHERED ROCK SAMPLED AS SILTY SAND WITH GRAVEL - light brown , dark orangish brown, moist, very dense.			120	22-50/4" (50/4")
25.0									
	S-9	SS	0	0					50/0" (50/0")
					AUGER REFUSAL at 28.0 FT				



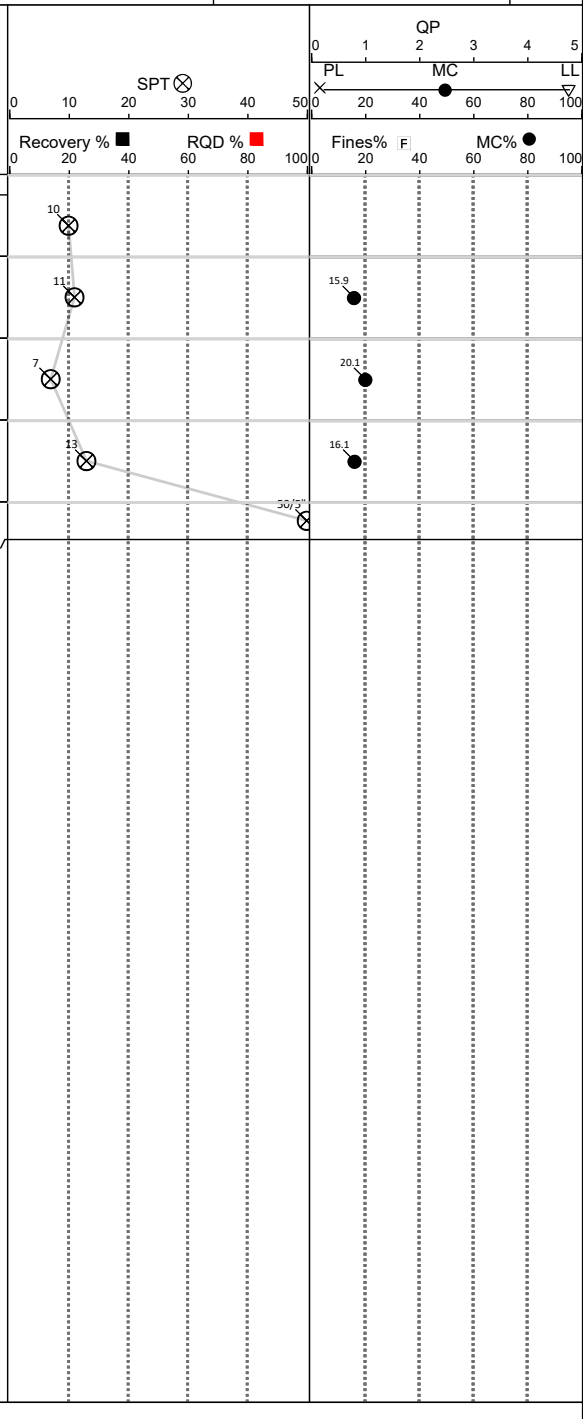
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	Dry	BORING STARTED:	02/19/2026	CAVE IN DEPTH:	Not Observed
WL (Completion):	Dry	BORING COMPLETED:	02/19/2026	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	Hollow Stem Auger (0'-28')
WL (Stabilized):		Acker Rebel	JT		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-05**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.09814314**	LONGITUDE: **-75.3164971**	STRUCTURE:	SURFACE ELEVATION: **142.5**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					Asphalt [Thickness=6"].				
	S-1	SS	18	10	FILL - (GC) SANDY GRAVEL WITH SILT - gray, moist, loose.				8-5-5 (10)
	S-2	SS	24	23	(ML) SILT WITH SAND - trace gravel, orangish brown , red, moist, loose to medium dense.			140	5-5-6-9 (11)
5.0	S-3	SS	24	9					7-4-3-6 (7)
	S-4	SS	24	15	(ML) SANDY SILT - trace gravel, orangish brown , red, moist, medium dense.			135	7-6-7-9 (13)
	S-5	SS	11	8	(WR) WEATHERED ROCK sampled as SANDY GRAVEL WITH SILT - light gray, moist, very dense.			134	27-50/5" (50/5")
					AUGER REFUSAL at 8.9 FT				



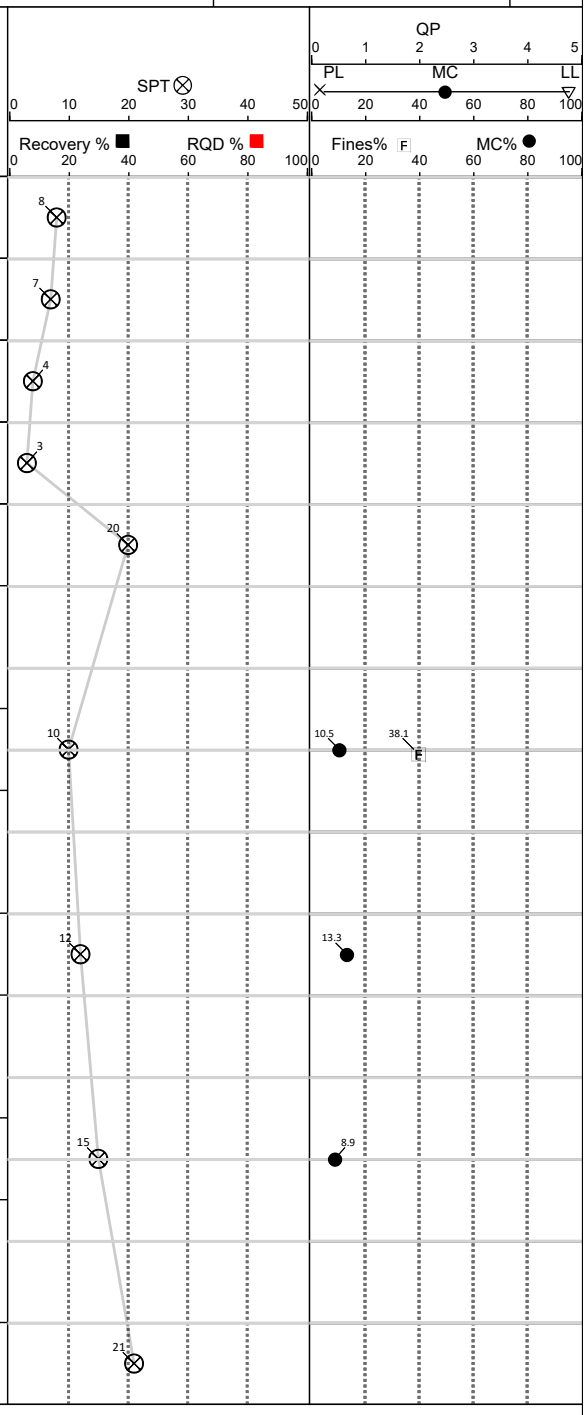
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	Dry	BORING STARTED:	12/30/2025	CAVE IN DEPTH:	Not Observed
WL (Completion):	Dry	BORING COMPLETED:	12/30/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	Hollow Stem Auger (0'-8.92')
WL (Stabilized):		Hand Augers/Wildcat	FC		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-06**	**1 OF 2**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.0983966**	LONGITUDE: **-75.31603594**	STRUCTURE:	SURFACE ELEVATION: **139**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	24	9	Asphalt [Thickness=4"]. FILL - (SM) SILTY SAND WITH GRAVEL - orangish brown , gray, moist, loose.		20-4-4-2 (8)
	S-2	SS	24	13			4-2-5-3 (7)
5.0	S-3	SS	24	21	FILL - (ML) SANDY SILT WITH GRAVEL - reddish brown , brown, contains wood and construction debris, moist to wet, very loose to medium dense.	135	2-2-2-2 (4)
	S-4	SS	24	2			0/12"-1-2 (3)
	S-5	SS	24	12		130	1-5-15-6 (20)
10.0							
	S-6	SS	24	17	(SM) SILTY SAND - orangish brown, moist, loose to medium dense.	125	4-5-5-7 (10)
15.0							
	S-7	SS	24	24		120	4-5-7-10 (12)
20.0							
	S-8	SS	24	21	(CL) LEAN CLAY - red, moist, stiff. (SM) SILTY SAND - orangish brown , light gray, moist, medium dense.	115	5-7-8-9 (15)
25.0							
	S-9	SS	24	24		110	4-5-16-16 (21)



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	5 FT : Perched	BORING STARTED:	12/30/2025	CAVE IN DEPTH:	Not Observed
WL (Completion):	Dry	BORING COMPLETED:	12/30/2025	HAMMER TYPE:	Automatic
WL (Seasonal High Water):		EQUIPMENT:	LOGGED BY:	DRILLING METHOD:	Hollow Stem Auger (0'-36.5')
WL (Stabilized):		Hand Augers/Wildcat	FC		

GEOTECHNICAL BOREHOLE LOG

CLIENT: **MW Studios**	PROJECT NO.: **44:2244**	BORING NO.: **B-06**	SHEET: **2 OF 2**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION 100%
LATITUDE: **40.0983966**	LONGITUDE: **-75.31603594**	STRUCTURE:	SURFACE ELEVATION: **139**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
35.0					(SM) SILTY SAND - orangish brown , light gray, moist, medium dense. (continued)			105 103	21
					AUGER REFUSAL at 36.5 FT				

SPT ⊗ 0 10 20 30 40 50 | Recovery % ■ RQD % ■ 0 20 40 60 80 100 | QP 0 1 2 3 4 5 | PL MC LL 0 20 40 60 80 100 | Fines% F MC% ● 0 20 40 60 80 100

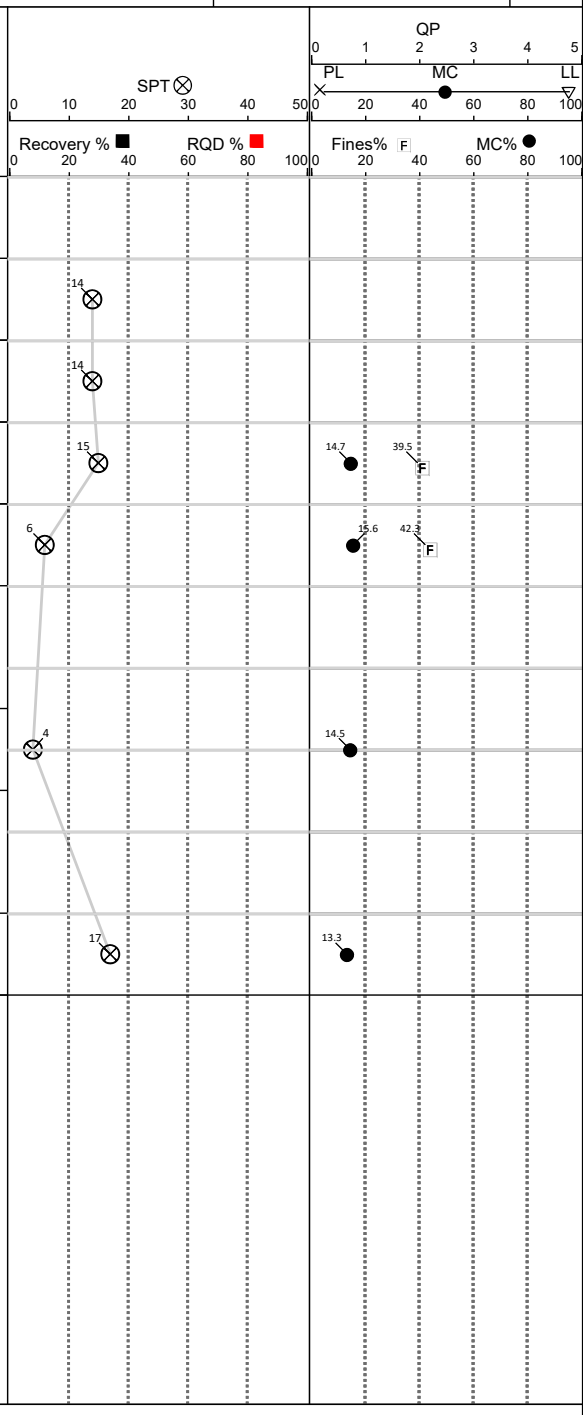
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	**5 FT : Perched**	**BORING STARTED:**	**12/30/2025**	**CAVE IN DEPTH:**	**Not Observed**
WL (Completion):	**Dry**	**BORING COMPLETED:**	**12/30/2025**	**HAMMER TYPE:**	**Automatic**
WL (Seasonal High Water):		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	
WL (Stabilized):		**Hand Augers/Wildcat**	**FC**	**Hollow Stem Auger (0'-36.5')**	

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-07**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.09869084**	LONGITUDE: **-75.31666055**	STRUCTURE:	SURFACE ELEVATION: **141**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
					Concrete [Thickness=8"].			140	
	S-1	SS	24	10	FILL - (ML) SANDY SILT WITH GRAVEL - brown, moist, medium dense.				3-6-8-8 (14)
5.0	S-2	SS	24	8					15-8-6-8 (14)
	S-3	SS	24	11	(SC-SM) SILTY CLAYEY SAND - orangish brown , tan , black, moist, medium dense.			135	5-10-5-5 (15)
	S-4	SS	24	9	(CL) SANDY LEAN CLAY - brown , reddish brown , orangish brown, contains mica, moist, firm.				3-3-3-3 (6)
10.0								130	
	S-5	SS	24	8	(SM) SILTY SAND - dark grayish brown , brown, contains rock fragments, moist, very loose to medium dense.				1-2-2-3 (4)
15.0								125	
	S-6	SS	24	18					13-12-5-5 (17)
					END OF BORING at 20.0 FT				



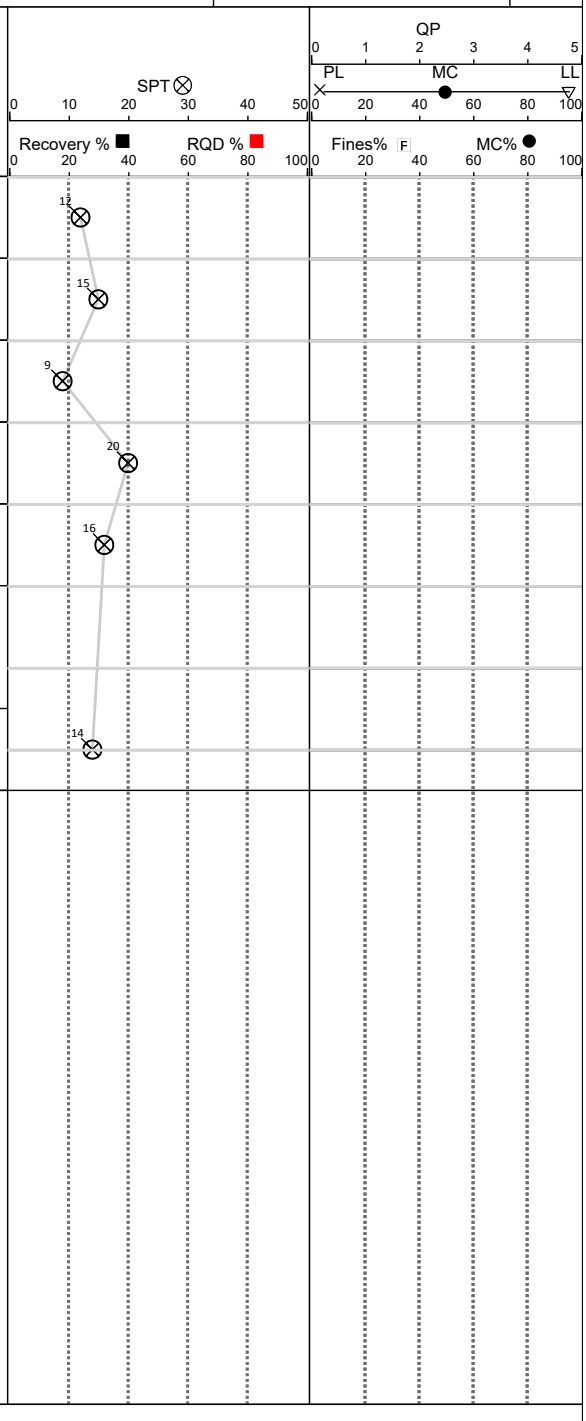
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	**Dry**	**BORING STARTED:**	**12/30/2025**	**CAVE IN DEPTH:**	**Not Observed**
WL (Completion):	**Dry**	**BORING COMPLETED:**	**12/30/2025**	**HAMMER TYPE:**	**Automatic**
WL (Seasonal High Water):		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	**Hollow Stem Auger (0'-20')**
WL (Stabilized):		**Hand Augers/Wildcat**	**MCT1**		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
MW Studios	**44:2244**	**B-08**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	DRILLER/CONTRACTOR: **Sano Drilling**		
SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**			LOSS OF CIRCULATION
LATITUDE: **40.09950604**	LONGITUDE: **-75.31646268**	STRUCTURE:	SURFACE ELEVATION: **125**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*
	S-1	SS	24	9	Topsoil [Thickness=9"]. FILL - (ML) SANDY SILT - brown, moist, medium dense.				WoH-4-8-5 (12)
	S-2	SS	24	8	FILL - (SM) SILTY SAND - trace gravel, black, contains wood, moist, loose to medium dense.				4-5-10-12 (15)
5.0	S-3	SS	24	3				120	2-6-3-11 (9)
	S-4	SS	24	24	FILL - (ML) SANDY SILT WITH CLAY - trace gravel, gray , brown, moist, medium dense.				8-9-11-8 (20)
	S-5	SS	24	12	FILL - (SM) SILTY SAND - trace gravel, black, contains brick, moist, medium dense, strong odor.				11-5-11-8 (16)
10.0								115	
	S-6	SS	24	16	POSSIBLE FILL - (ML) CLAYEY SILT WITH SAND - brown, moist, stiff.				3-6-8-15 (14)
								110	
					END OF BORING at 15.0 FT				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered):	**Dry**	**BORING STARTED:**	**02/19/2026**	**CAVE IN DEPTH:**	**Not Observed**
WL (Completion):	**Dry**	**BORING COMPLETED:**	**02/19/2026**	**HAMMER TYPE:**	**Automatic**
WL (Seasonal High Water):		**EQUIPMENT:**	**LOGGED BY:**	**DRILLING METHOD:**	**Hollow Stem Auger (0'-15')**
WL (Stabilized):		**Acker Rebel**	**JT**		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	TEST PIT NO.:	SHEET:
MW Studios	**44:2244**	**TP-01**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**		
LATITUDE: **40.098776**	LONGITUDE: **-75.316771**	STATION:	SURFACE ELEVATION: **141**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DECRIPTION OF MATERIAL	STRATIGRAPHY	DCP	EXCAVATION EFFORT	QP(TSF)	SAMPLE NUMBER	Moisture Content %
		140.	Topsoil [Thickness=3"]. FILL - (ML) SANDY SILT - brown, moist, contains rope, trash, and brick.			Easy		S-1	13.7
		136.				Difficult			
			BUCKET REFUSAL at 4.2 FT						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered): Dry	**WL (Seasonal High Water):**	**CONTRACTOR:**	**OPERATOR:**	**MAKE/MODEL:**
WL (Completion): Dry		**Sano Drilling**	**J. DeAngelo**	**Bobcat E60**
ECS REP.:	**DATE COMPLETED:**	**UNITS:**	**CAVE-IN-DEPTH:**	
MCT	**12/30/2025**	**English**	**Not Observed**	

TEST PIT LOG

CLIENT: **MW Studios**	PROJECT NO.: **44:2244**	TEST PIT NO.: **TP-02**	SHEET: **1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**		
LATITUDE: **40.098649**	LONGITUDE: **-75.316993**	STATION:	SURFACE ELEVATION: **141.5**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DECRIPTION OF MATERIAL	STRATIGRAPHY	DCP	EXCAVATION EFFORT	QP(TSF)	SAMPLE NUMBER	Moisture Content %
			Topsoil [Thickness=3"].						
			FILL - (ML) SANDY SILT WITH GRAVEL - brown , black, contains metal, moist.			Easy		S-1	13.6
		140.							
			(ML) SANDY SILT WITH GRAVEL - orangish brown, moist.			Medium			
		138.							
			END OF TEST PIT at 3.0 FT						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered): Dry	WL (Seasonal High Water):	CONTRACTOR:	OPERATOR:	MAKE/MODEL:
WL (Completion): Dry		Sano Drilling	J. DeAngelo	Bobcat E60
ECS REP.:	DATE COMPLETED:	UNITS:	CAVE-IN-DEPTH:	
MCT	12/30/2025	English	Not Observed	

TEST PIT LOG

CLIENT: **MW Studios**	PROJECT NO.: **44:2244**	TEST PIT NO.: **TP-03**	SHEET: **1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**		

LATITUDE: **40.098770**	LONGITUDE: **-75.316988**	STATION:	SURFACE ELEVATION: **138**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DECRIPTION OF MATERIAL	STRATIGRAPHY	DCP	EXCAVATION EFFORT	QP(TSF)	SAMPLE NUMBER	Moisture Content %
			Topsoil [Thickness=3"].						
			(ML) SANDY SILT - trace gravel and clay, brown , orangish brown, moist.			Medium		S-1	16.0
		135 134.							
			END OF TEST PIT at 3.4 FT						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered): Dry	**WL (Seasonal High Water):**	**CONTRACTOR:**	**OPERATOR:**	**MAKE/MODEL:**
WL (Completion): Dry		**Sano Drilling**		
ECS REP.:	**DATE COMPLETED:**	**UNITS:**	**CAVE-IN-DEPTH:**	
	12/30/2025	**English**	**Not Observed**	

TEST PIT LOG

CLIENT:	PROJECT NO.:	TEST PIT NO.:	SHEET:
MW Studios	**44:2244**	**TP-04**	**1 OF 1**
PROJECT NAME: **Montgomery Co. Fire Training Building**	SITE LOCATION: **1175 Conshohoken Road, Conshohoken, Pennsylvania, 19428**		
LATITUDE: **40.098919**	LONGITUDE: **-75.316945**	STATION:	SURFACE ELEVATION: **134**

DEPTH (FT)	WATER LEVELS	ELEVATION (FT)	DECRIPTION OF MATERIAL	STRATIGRAPHY	DCP	EXCAVATION EFFORT	QP(TSF)	SAMPLE NUMBER	Moisture Content %
			Topsoil [Thickness=3"]. FILL - (ML) SANDY SILT WITH GRAVEL - brown , black, contains brick, wood and construction debris, moist, odor.			Easy		S-1	16.7
			END OF TEST PIT at 3.0 FT						

REMARKS:

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

EXCAVATION EFFORT: E-EASY M-MEDIUM D-DIFFICULT VD-VERY DIFFICULT

WL (First Encountered): Dry	**WL (Seasonal High Water):**	**CONTRACTOR:**	**OPERATOR:**	**MAKE/MODEL:**
WL (Completion): Dry		**Sano Drilling**	**J. DeAngelo**	**Bobcat E60**
ECS REP.:	**DATE COMPLETED:**	**UNITS:**	**CAVE-IN-DEPTH:**	
MCT	**12/30/2025**	**English**	**Not Observed**	

TEST PIT LOG

B-01
R-1 Top
17 ft



B-01
R-1 Bottom
22 ft

B-02
R-1 Top
14.4 ft



B-02
R-1 Bottom
19.4 ft

BORING	RUN	TOP DEPTH	BOTTOM DEPTH	RUN LENGTH	RECOVERY (REC)		ROCK QUALITY DESIGNATION (RQD)		DESCRIPTION OF ROCK QUALITY
		Feet	Feet	inches	inches	%	inches	%	
B-01	R-1	17.0	22.0	60	46	77	11	18	Very Poor
B-02	R-2	7.0	12.0	60	8	25	11	18	Very Poor

Montgomery County Fire Training Building

1175 Conshohocken Road
Conshohocken, Montgomery County, Pennsylvania

MW Studios

ROCK CORE PHOTOLOG

ECS Project No. 44:2244
Boring No. B-01 and B-02
Date of Drilling: 2/19/2026

Double Ring Infiltration Test Results
Montgomery County Fire Training Building
ECS Project No. 44:2244

Date Tested:	12/18/2025	12/18/2025	12/18/2025	12/18/2025
Water Temperature:	33.1 °F	37.6 °F	36.9 °F	33.1 °F

Field Data	TP-01A		TP-02A		TP-03A		TP-04A	
Test Depth (ft)	2.3		1.0		1.0		1.0	
	Time	Reading	Time	Reading	Time	Reading	Time	Reading
Presoak Start/Water Depth (in)	8:17	6.00	8:28	6.00	8:38	6.00	8:50	6.00
Presoak 30 Min (in)	8:47	0.75	8:58	0.25	9:08	0.13	9:20	0.00
Presoak 60 Min (in)	9:17	0.25	9:28	0.00	9:38	0.00	9:50	0.00
START TEST (in)	9:17	6.00	9:28	6.00	9:38	6.00	9:50	6.00
Reading Interval	30 min		30 min		30 min		30 min	
Reading # 1 (in)	9:47	0.25	9:58	0.00	10:08	0.00	10:20	0.00
Reading # 2 (in)	10:17	0.13	10:28	0.00	10:38	0.00	10:50	0.00
Reading # 3 (in)	10:47	0.13	10:58	0.00	11:08	0.00	11:20	0.00
Reading # 4 (in)	11:17	0.13	11:28	0.00	11:38	0.00	11:50	0.00
Reading # 5 (in)								
Reading # 6 (in)								
Reading # 7 (in)								
Reading # 8 (in)								
Initial Water Depth (in)	6.00		6.00		6.00		6.00	
Average Reading (in)	0.16		0.00		0.00		0.00	
Infiltration Rate (in/hr)	0.31		0.00		0.00		0.00	
Safety Factor	2.00		2.00		2.00		2.00	
Field Adjusted Rate with Safety Factor (in/hr)	0.16		0.00		0.00		0.00	
Temperature Adjustment Factor	1.62		1.54		1.56		1.62	
Corrected Infiltration Rate (in/hr)	**0.25**		**0.00**		**0.00**		**0.00**	

ECS Project # 44:2244
Montgomery County
Fire Training Building
Infiltration Testing Field Measurements

Date Tested: 12/30/2025

Field Data	B-07	
Test Depth	6.0 ft	
	Time	Reading
Presoak Start/Water Depth	11:24	9.0
Presoak 30 Min	11:54	0.13
Presoak 60 Min	12:24	0.00
START TEST	12:24	9.0
Reading Interval	30 min	
Reading # 1 (in)	12:54	0.00
Reading # 2 (in)	13:24	0.00
Reading # 3 (in)	13:54	0.00
Reading # 4 (in)	14:24	0.00
Reading # 5 (in)		
Reading # 6 (in)		
Reading # 7 (in)		
Reading # 8 (in)		
Reading # 9 (in)		
Diameter of Casing (in)	4.00	
Initial Water Depth (in)	9.00	
Final Water Level Drop (in)	0.00	
Average Reading (in)	0.00	
Infiltration Rate (in/hr)	0.00	
Safety Factor	2.00	
Corrected Infiltration Rate (in/hr)	**0.00**	

Notes:
1. Tested with Cased Borehole Method
2. Readings #1 through #9 indicate drop in water level

Appendix C - Laboratory Testing

Laboratory Testing Summary
Grain Size Analysis/Analyses
Plasticity Chart(s)

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-01	S-2	2.0-4.0	18.4										
B-01	S-3	4.0-6.0	11.8	SM	NP	NP	NP	48.3					
B-01	S-4	6.0-8.0	13.3										
B-01	S-5	8.0-10.0	7.3										
B-01	S-6	13.0-14.4	1.3										
B-02	S-1	0.0-2.0	18.2										
B-02	S-2	2.0-4.0	4.4										
B-02	S-3	4.0-6.0	2.9	GM	NP	NP	NP	17.7					
B-02	S-6	13.0-14.3	5.2										
B-03	S-2	2.0-4.0	19.6										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Montgomery Co. Fire Training Building
Client: MW Studios

Project No.: 44:2244
Date Reported: 3/5/2026



Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-03	S-3	4.0-6.0	11.9										
B-03	S-4	6.0-8.0	2.0	GP-GM	NP	NP	NP	10.7					
B-03	S-5	8.0-10.0	5.3										
B-03	S-6	13.0-15.0	9.0										
B-03	S-7	18.0-20.0	11.5										
B-04	S-2	2.0-4.0	17.1										
B-04	S-3	4.0-6.0	9.3										
B-04	S-4	6.0-8.0	5.9	SM	NP	NP	NP	17.2					
B-04	S-5	8.0-10.0	4.1										
B-04	S-6	13.0-15.0	10.6										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Montgomery Co. Fire Training Building
Client: MW Studios

Project No.: 44:2244
Date Reported: 3/5/2026



Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-04	S-7	18.0-20.0	6.6										
B-05	S-2	2.0-4.0	15.9										
B-05	S-3	4.0-6.0	20.1										
B-05	S-4	6.0-8.0	16.1										
B-06	S-6	13.0-15.0	10.5	SM	NP	NP	NP	38.1					
B-06	S-7	18.0-20.0	13.3										
B-06	S-8	23.0-25.0	8.9										
B-07	S-3	6.0-8.0	14.7	SM	NP	NP	NP	39.5					
B-07	S-4	8.0-10.0	15.6	SM	NP	NP	NP	42.3					
B-07	S-5	13.0-15.0	14.5										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Montgomery Co. Fire Training Building
Client: MW Studios

Project No.: 44:2244
Date Reported: 3/5/2026



Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-07	S-6	18.0-20.0	13.3										
TP-01	S-1	2.0-2.5	13.7	SM	NP	NP	NP	49.7					
TP-02	S-1	1.0-1.5	13.6	SC	30	19	11	47.7					
TP-03	S-1	1.0-1.5	16.0	SC	28	20	8	47.1					
TP-04	S-1	1.0-1.5	16.7	ML	NP	NP	NP	52.9					

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

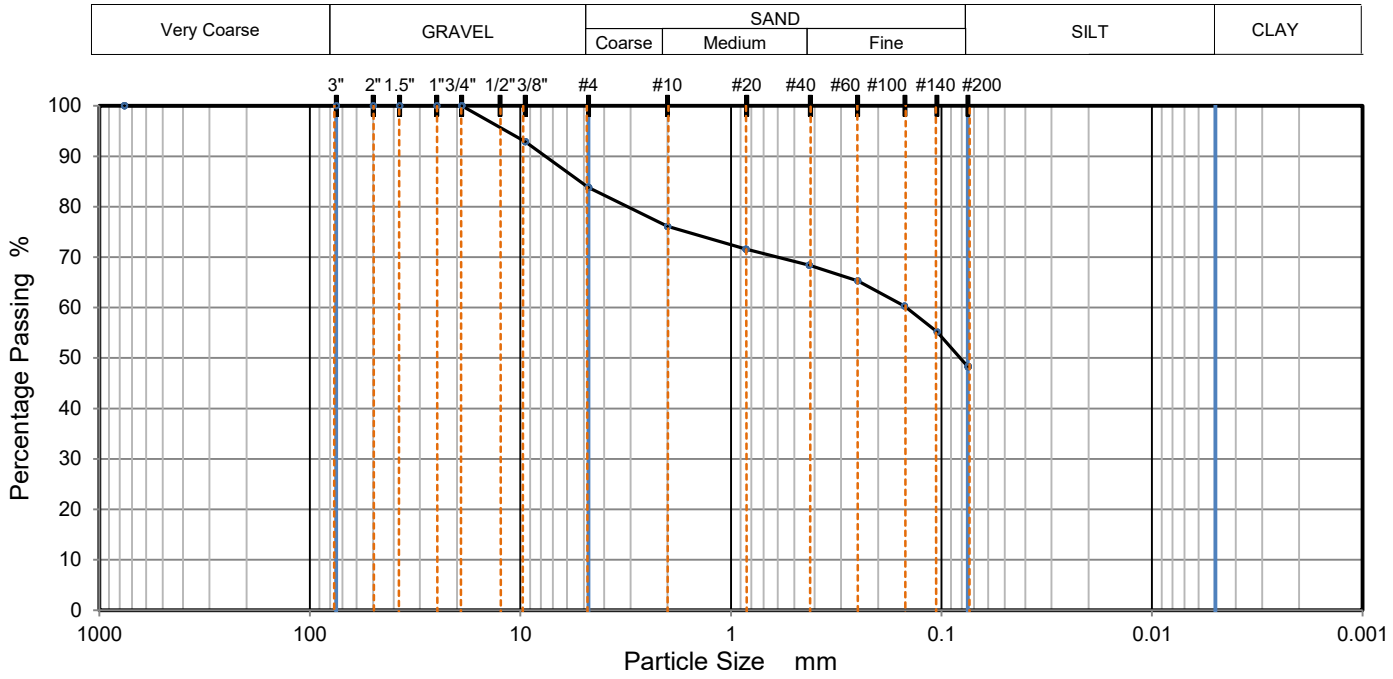
Project: Montgomery Co. Fire Training Building
Client: MW Studios

Project No.: 44:2244
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B)

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	92.9		
#4	83.8		
#10	76.1		
#20	71.6		
#40	68.4		
#60	65.3		
#100	60.3		
#140	55.2		
#200	48.3		

Dry Mass of sample, g	92.8

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	16.2
Coarse Sand, #4 to #10 sieve	7.7
Medium Sand, #10 to #40	7.7
Fine Sand, #40 to #200	20.1
Fines <#200	48.3

USCS	SM	Liquid Limit	NP	D90	7.617	D50	0.081	D10	
AASHTO	A-4	Plastic Limit	NP	D85	5.205	D30		Cu	
USCS Group Name	Silty Sand with Gravel	Plasticity Index	NP	D60	0.147	D15		Cc	

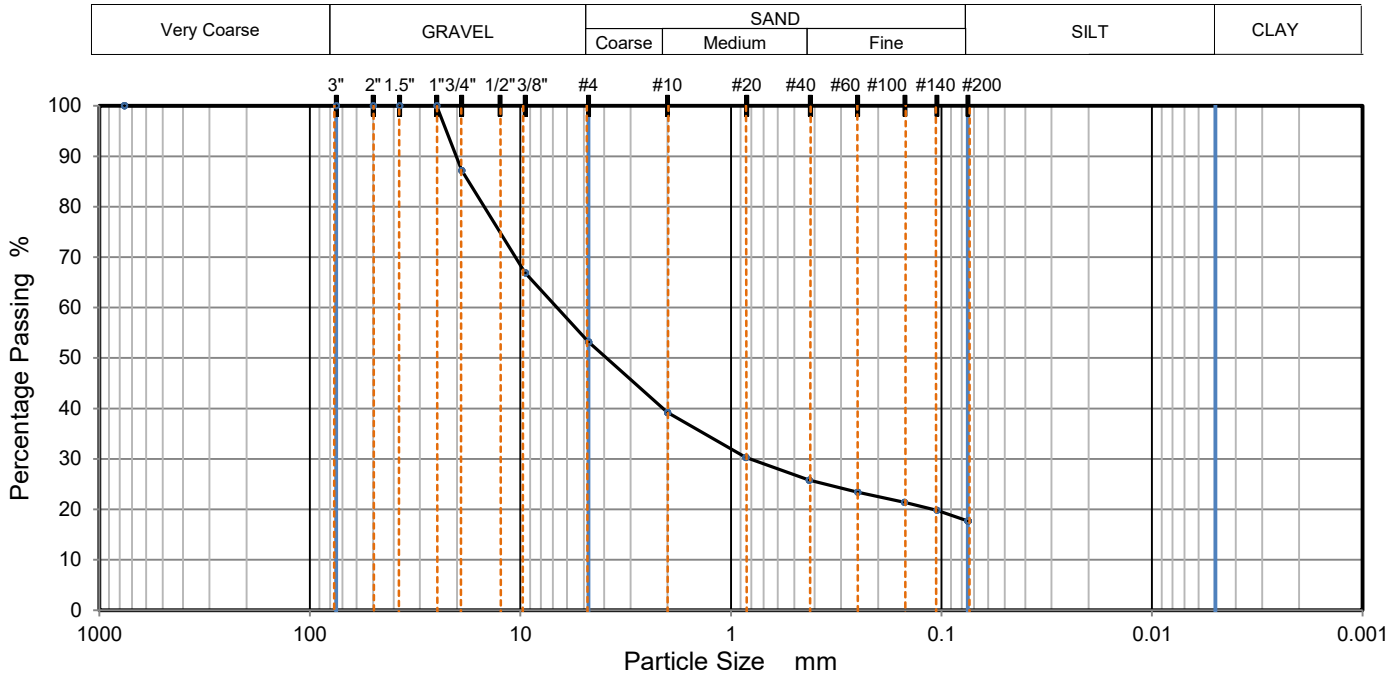
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Light Brown Silty Sand with Gravel
Sample Source: B-01

Project No.: 44:2244
Depth (ft): 4.0 - 6.0
Sample No.: S-3
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B)

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	87.2		
3/8"	66.9		
#4	53.2		
#10	39.2		
#20	30.3		
#40	25.8		
#60	23.4		
#100	21.4		
#140	19.8		
#200	17.7		

Dry Mass of sample, g	186.2

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	46.8
Coarse Sand, #4 to #10 sieve	14.0
Medium Sand, #10 to #40	13.4
Fine Sand, #40 to #200	8.1
Fines <#200	17.7

USCS	GM	Liquid Limit	NP	D90	20.180	D50	3.898	D10	
AASHTO	A-1	Plastic Limit	NP	D85	17.630	D30	0.812	Cu	
USCS Group Name	Silty Gravel with Sand	Plasticity Index	NP	D60	6.701	D15		Cc	

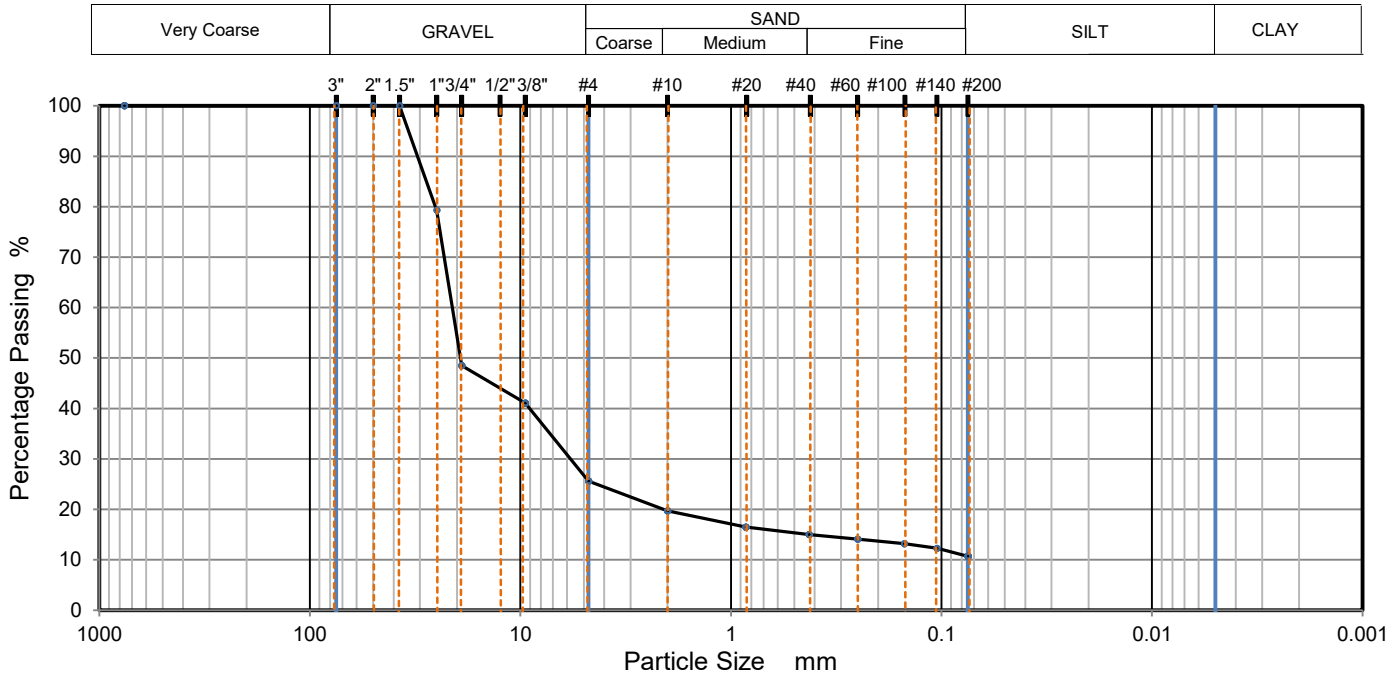
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Light Brown Silty Gravel with Sand
Sample Source: B-02

Project No.: 44:2244
Depth (ft): 4.0 - 6.0
Sample No.: S-3
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B)

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	79.3		
3/4"	48.5		
3/8"	41.1		
#4	25.6		
#10	19.7		
#20	16.5		
#40	15.0		
#60	14.1		
#100	13.2		
#140	12.3		
#200	10.7		

Dry Mass of sample, g	211.2

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	74.4
Coarse Sand, #4 to #10 sieve	5.9
Medium Sand, #10 to #40	4.7
Fine Sand, #40 to #200	4.3
Fines <#200	10.7

USCS	GP-GM	Liquid Limit	NP	D90	30.830	D50	19.260	D10	
AASHTO	A-1	Plastic Limit	NP	D85	27.950	D30	5.783	Cu	
USCS Group Name	Poorly Graded Gravel with Silt	Plasticity Index	NP	D60	21.050	D15	0.425	Cc	

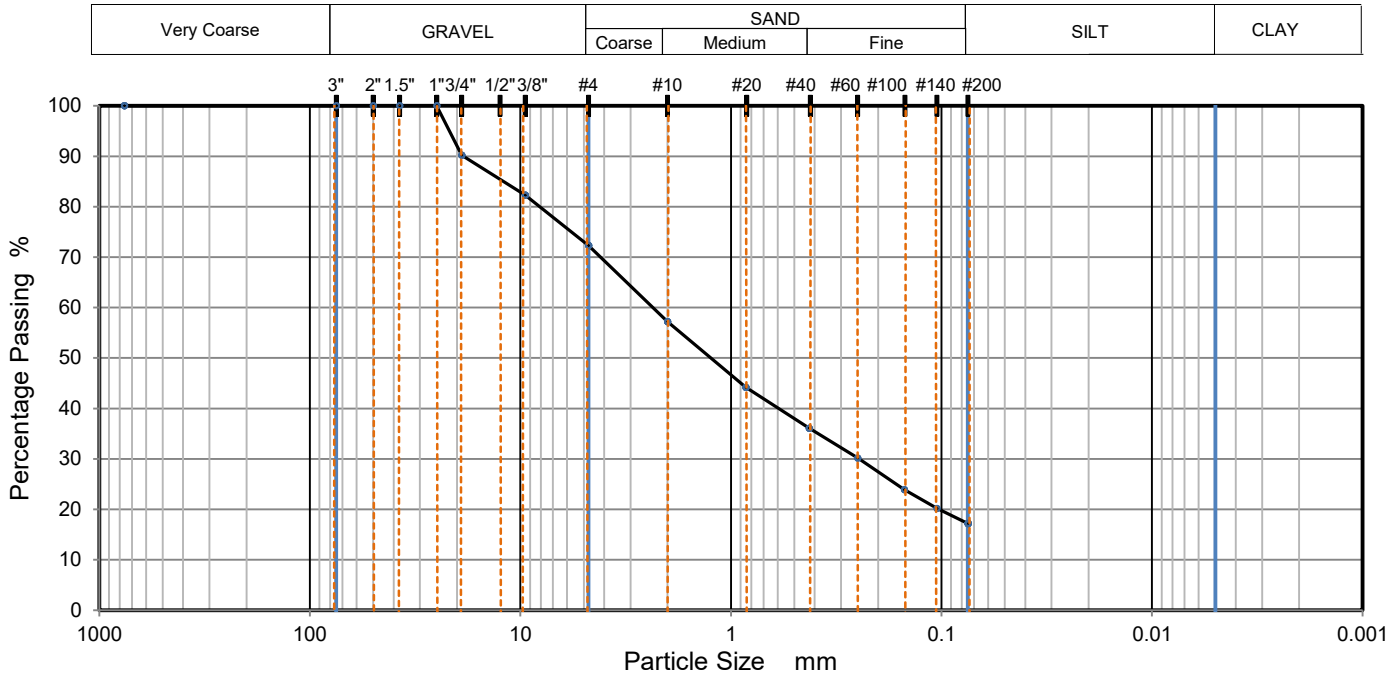
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description:
Sample Source: B-03

Project No.: 44:2244
Depth (ft): 6.0 - 8.0
Sample No.: S-4
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B)

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	90.2		
3/8"	82.3		
#4	72.3		
#10	57.2		
#20	44.2		
#40	36.1		
#60	30.2		
#100	23.9		
#140	20.2		
#200	17.2		

Dry Mass of sample, g	154.5

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	27.7
Coarse Sand, #4 to #10 sieve	15.1
Medium Sand, #10 to #40	21.1
Fine Sand, #40 to #200	18.9
Fines <#200	17.2

USCS	SM	Liquid Limit	NP	D90	18.670	D50	1.245	D10	
AASHTO	A-1	Plastic Limit	NP	D85	12.040	D30	0.246	Cu	
USCS Group Name	Silty Sand with Gravel	Plasticity Index	NP	D60	2.348	D15		Cc	

Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Brown Poorly Graded Gravel with Sand
Sample Source: B-04

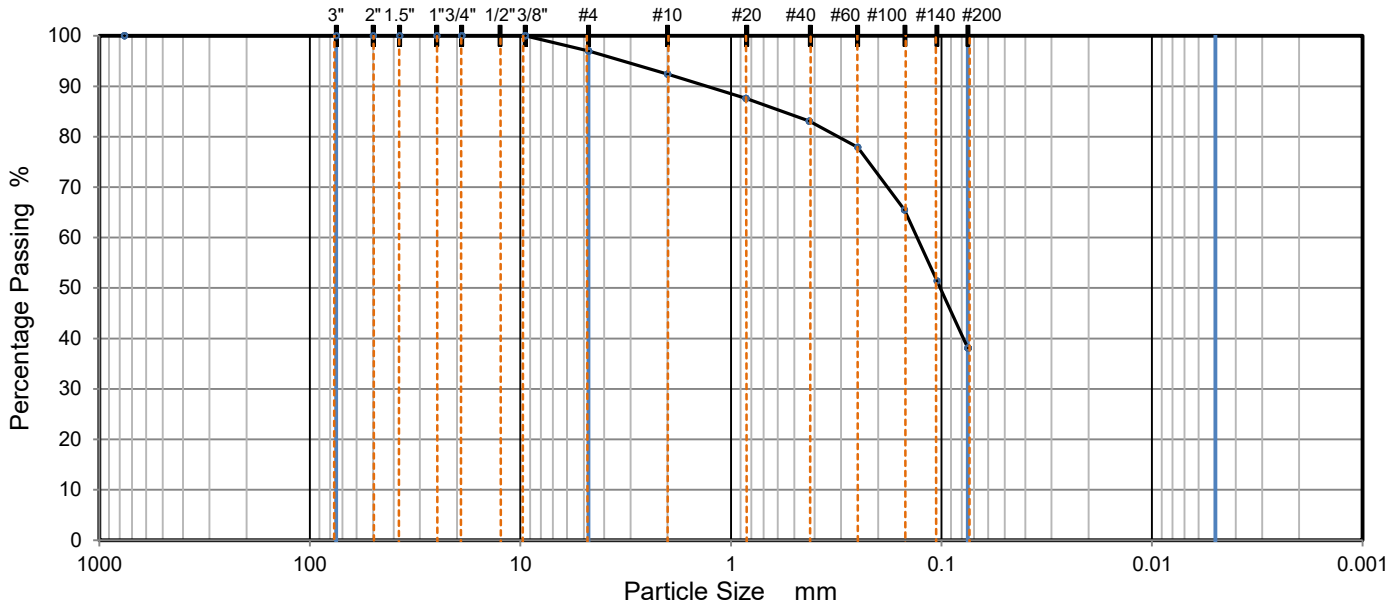
Project No.: 44:2244
Depth (ft): 6.0 - 8.0
Sample No.: S-4
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D6913M-17-METHOD B)

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	100.0		
#4	97.0		
#10	92.4		
#20	87.6		
#40	83.1		
#60	77.9		
#100	65.5		
#140	51.4		
#200	38.1		

Dry Mass of sample, g	86.7

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	3.0
Coarse Sand, #4 to #10 sieve	4.6
Medium Sand, #10 to #40	9.3
Fine Sand, #40 to #200	45.0
Fines <#200	38.1

USCS	SM	Liquid Limit	NP	D90	1.304	D50	0.101	D10	
AASHTO	A-4	Plastic Limit	NP	D85	0.570	D30		Cu	
USCS Group Name	Silty Sand	Plasticity Index	NP	D60	0.131	D15		Cc	

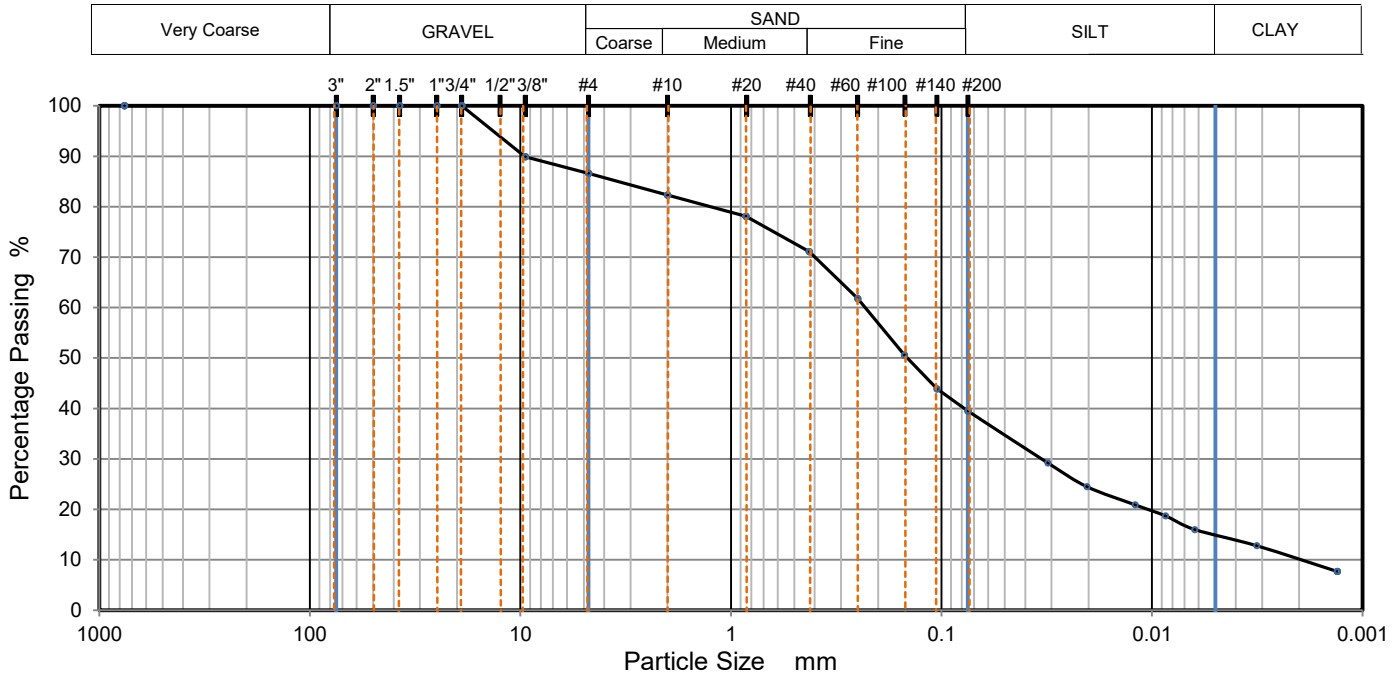
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Orangish Brown Silty Sand
Sample Source: B-06

Project No.: 44:2244
Depth (ft): 13.0 - 15.0
Sample No.: S-6
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B & ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0313	29.2
2"	100.0	0.0204	24.5
1 1/2"	100.0	0.0120	20.9
1"	100.0	0.0086	18.7
3/4"	100.0	0.0063	16.0
3/8"	89.9	0.0032	12.8
#4	86.6	0.0013	7.7
#10	82.3		
#20	78.1		
#40	71.1		
#60	61.8	Specific Gravity (Historical)	
#100	50.6	2.65	
#140	43.9		
#200	39.5		

Dry Mass of sample, g	220.6

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	13.4
Coarse Sand, #4 to #10 sieve	4.3
Medium Sand, #10 to #40	11.2
Fine Sand, #40 to #200	31.6
Silt, 75µm to 5 µm	24.6
Clay < 5µm	14.9

USCS	SM	Liquid Limit	NP	D90	9.565	D50	0.145	D10	0.002
AASHTO	A-4	Plastic Limit	NP	D85	3.443	D30	0.033	Cu	117.141
USCS Group Name	Silty Sand	Plasticity Index	NP	D60	0.230	D15	0.005	Cc	2.471

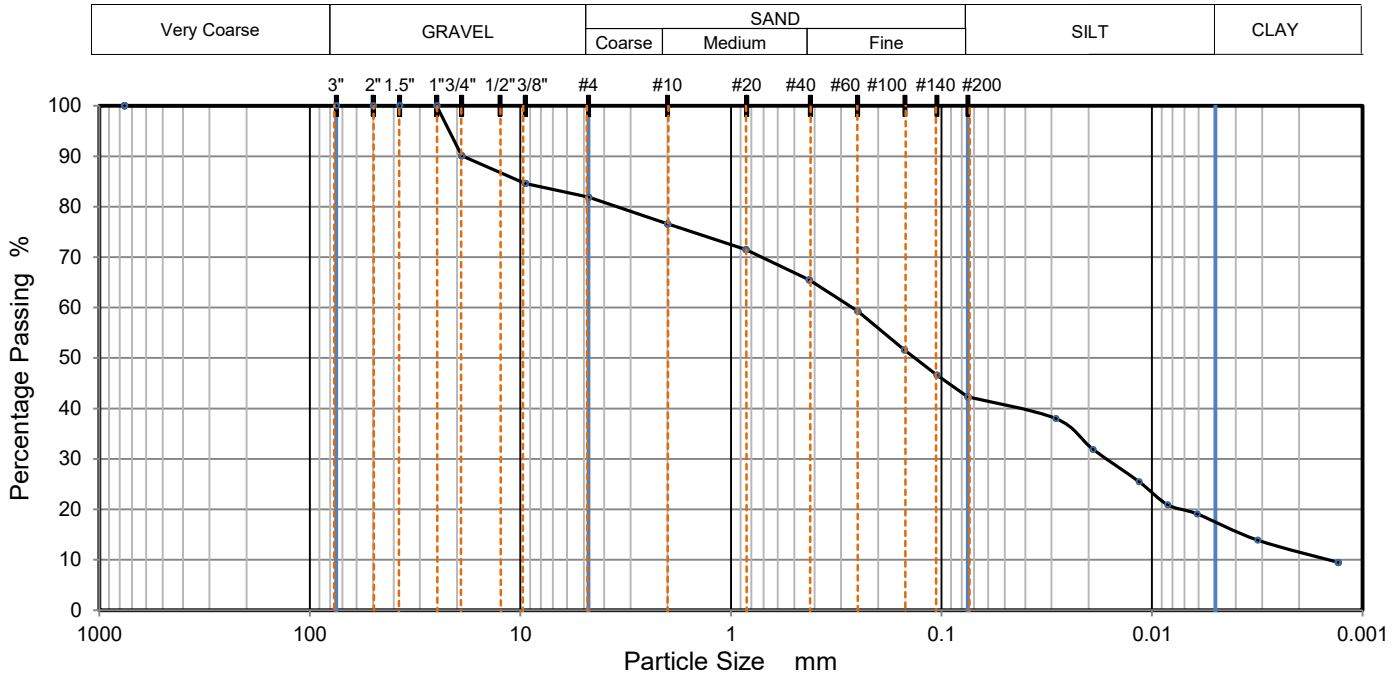
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description:Dark Brown Silty Sand
Sample Source: B-07

Project No.: 44:2244
Depth (ft): 6.0 - 8.0
Sample No.: S-3
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B & ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0286	38.0
2"	100.0	0.0191	31.9
1 1/2"	100.0	0.0115	25.5
1"	100.0	0.0084	20.9
3/4"	90.1	0.0061	19.1
3/8"	84.6	0.0032	13.9
#4	81.9	0.0013	9.5
#10	76.6		
#20	71.5		
#40	65.5		
#60	59.3	Specific Gravity (Historical)	
#100	51.6	2.65	
#140	46.6		
#200	42.3		

Dry Mass of sample, g	268.3

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	18.1
Coarse Sand, #4 to #10 sieve	5.3
Medium Sand, #10 to #40	11.1
Fine Sand, #40 to #200	23.2
Silt, 75µm to 5 µm	24.8
Clay < 5µm	17.5

USCS	SM	Liquid Limit	NP	D90	18.760	D50	0.134	D10	0.001
AASHTO	A-4	Plastic Limit	NP	D85	9.991	D30	0.016	Cu	184.050
USCS Group Name	Silty Sand with Gravel	Plasticity Index	NP	D60	0.265	D15	0.004	Cc	0.704

Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Brown Silty Sand
Sample Source: B-07

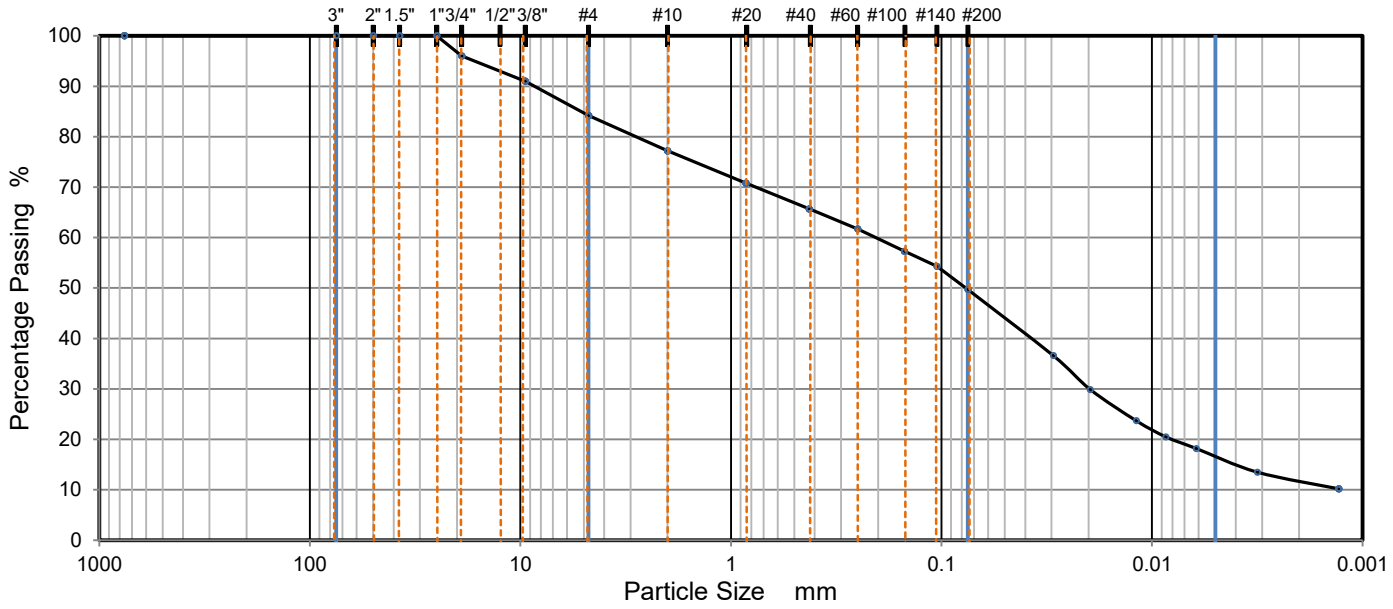
Project No.: 44:2244
Depth (ft): 8.0 - 10.0
Sample No.: S-4
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D6913M-17-METHOD B & ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0294	36.6
2"	100.0	0.0197	29.9
1 1/2"	100.0	0.0119	23.7
1"	100.0	0.0086	20.5
3/4"	96.0	0.0062	18.2
3/8"	91.0	0.0032	13.5
#4	84.2	0.0013	10.2
#10	77.2		
#20	70.8		
#40	65.7		
#60	61.7	Specific Gravity (Historical)	
#100	57.3	2.65	
#140	54.3		
#200	49.7		

Dry Mass of sample, g	646.8

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	15.8
Coarse Sand, #4 to #10 sieve	7.0
Medium Sand, #10 to #40	11.5
Fine Sand, #40 to #200	16.0
Silt, 75µm to 5 µm	33.0
Clay < 5µm	16.7

USCS	SM	Liquid Limit	NP	D90	8.579	D50	0.077	D10	
AASHTO	A-4	Plastic Limit	NP	D85	5.154	D30	0.020	Cu	
USCS Group Name	Silty Sand with Gravel	Plasticity Index	NP	D60	0.205	D15	0.004	Cc	

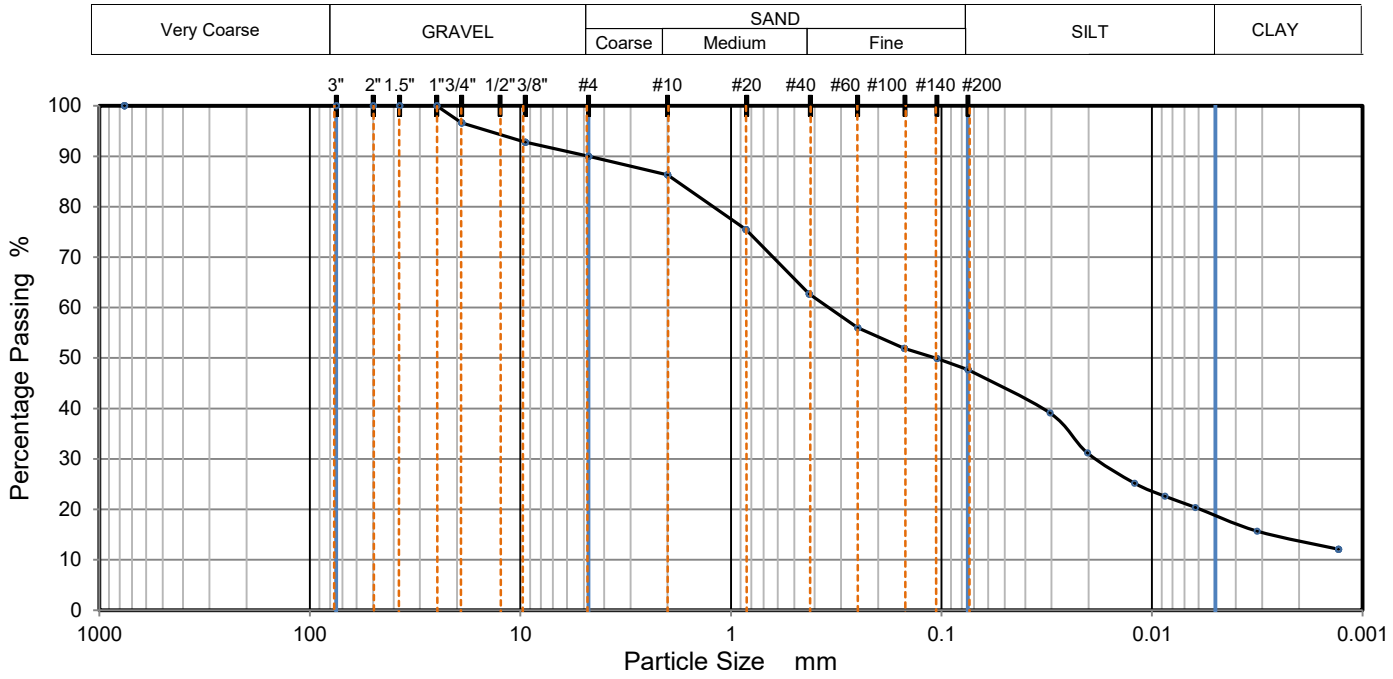
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Brown Silty Sand with Gravel
Sample Source: TP-01

Project No.: 44:2244
Depth (ft): 2.0 - 2.5
Sample No.: S-1
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
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Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B & ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0305	39.1
2"	100.0	0.0203	31.2
1 1/2"	100.0	0.0121	25.2
1"	100.0	0.0087	22.6
3/4"	96.6	0.0062	20.4
3/8"	92.8	0.0032	15.7
#4	90.0	0.0013	12.1
#10	86.3		
#20	75.5		
#40	62.7		
#60	56.0	Specific Gravity (Historical)	
#100	51.9	2.65	
#140	49.9		
#200	47.7		

Dry Mass of sample, g	865.3

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	10.0
Coarse Sand, #4 to #10 sieve	3.7
Medium Sand, #10 to #40	23.6
Fine Sand, #40 to #200	15.0
Silt, 75µm to 5 µm	28.8
Clay < 5µm	18.9

USCS	SC	Liquid Limit	30	D90	4.750	D50	0.107	D10	
AASHTO	A-6	Plastic Limit	19	D85	1.804	D30	0.018	Cu	
USCS Group Name	Clayey Sand	Plasticity Index	11	D60	0.343	D15	0.003	Cc	

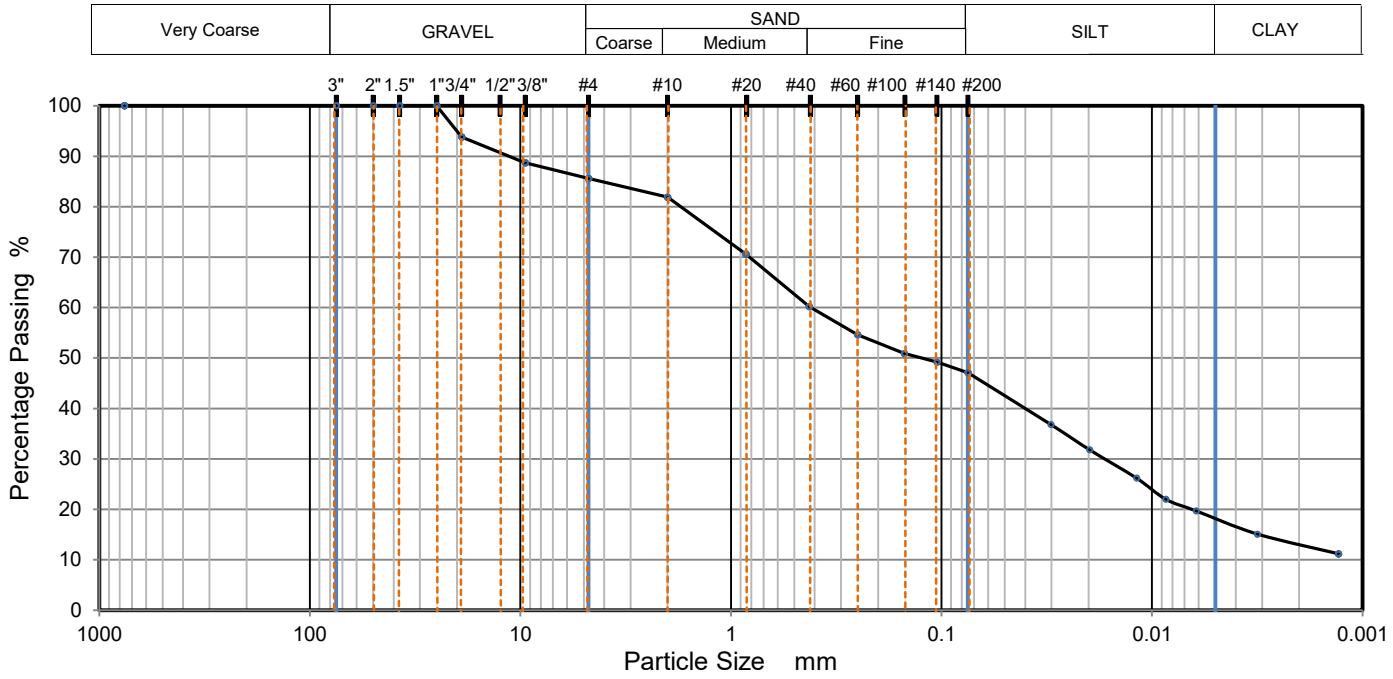
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Dark Brown Clayey Sand
Sample Source: TP-02

Project No.: 44:2244
Depth (ft): 1.0 - 1.5
Sample No.: S-1
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B & ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0302	36.8
2"	100.0	0.0198	31.8
1 1/2"	100.0	0.0119	26.2
1"	100.0	0.0086	22.0
3/4"	93.8	0.0062	19.7
3/8"	88.7	0.0032	15.1
#4	85.6	0.0013	11.2
#10	81.9		
#20	70.6		
#40	60.2		
#60	54.6	Specific Gravity (Historical)	
#100	50.9	2.65	
#140	49.2		
#200	47.1		

Dry Mass of sample, g	664.3

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	14.4
Coarse Sand, #4 to #10 sieve	3.7
Medium Sand, #10 to #40	21.7
Fine Sand, #40 to #200	13.1
Silt, 75µm to 5 µm	28.8
Clay < 5µm	18.3

USCS	SC	Liquid Limit	28	D90	11.340	D50	0.124	D10	
AASHTO	A-4	Plastic Limit	20	D85	4.128	D30	0.017	Cu	
USCS Group Name	Clayey Sand	Plasticity Index	8	D60	0.417	D15	0.003	Cc	

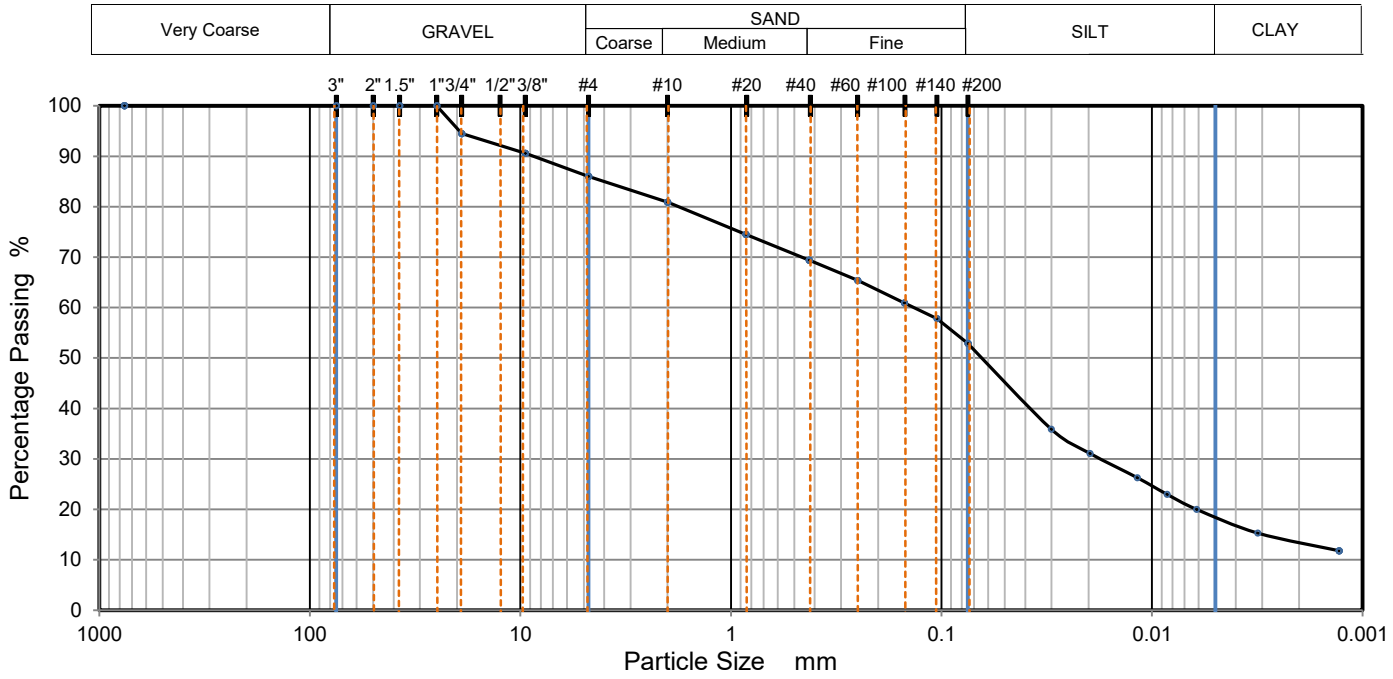
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Brown Clayey Sand
Sample Source: TP-03

Project No.: 44:2244
Depth (ft): 1.0 - 1.5
Sample No.: S-1
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D6913M-17-METHOD B & ASTM D422-63(2007))

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0	0.0301	35.9
2"	100.0	0.0197	31.1
1 1/2"	100.0	0.0118	26.3
1"	100.0	0.0085	23.0
3/4"	94.5	0.0061	20.0
3/8"	90.6	0.0032	15.3
#4	86.0	0.0013	11.8
#10	80.9		
#20	74.5		
#40	69.4		
#60	65.4	Specific Gravity (Historical)	
#100	60.9	2.65	
#140	57.8		
#200	52.9		

Dry Mass of sample, g	939.0

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	14.0
Coarse Sand, #4 to #10 sieve	5.1
Medium Sand, #10 to #40	11.5
Fine Sand, #40 to #200	16.5
Silt, 75µm to 5 µm	34.3
Clay < 5µm	18.6

USCS	ML	Liquid Limit	NP	D90	8.679	D50	0.064	D10	
AASHTO	A-4	Plastic Limit	NP	D85	4.009	D30	0.018	Cu	
USCS Group Name	Sandy Silt	Plasticity Index	NP	D60	0.135	D15	0.003	Cc	

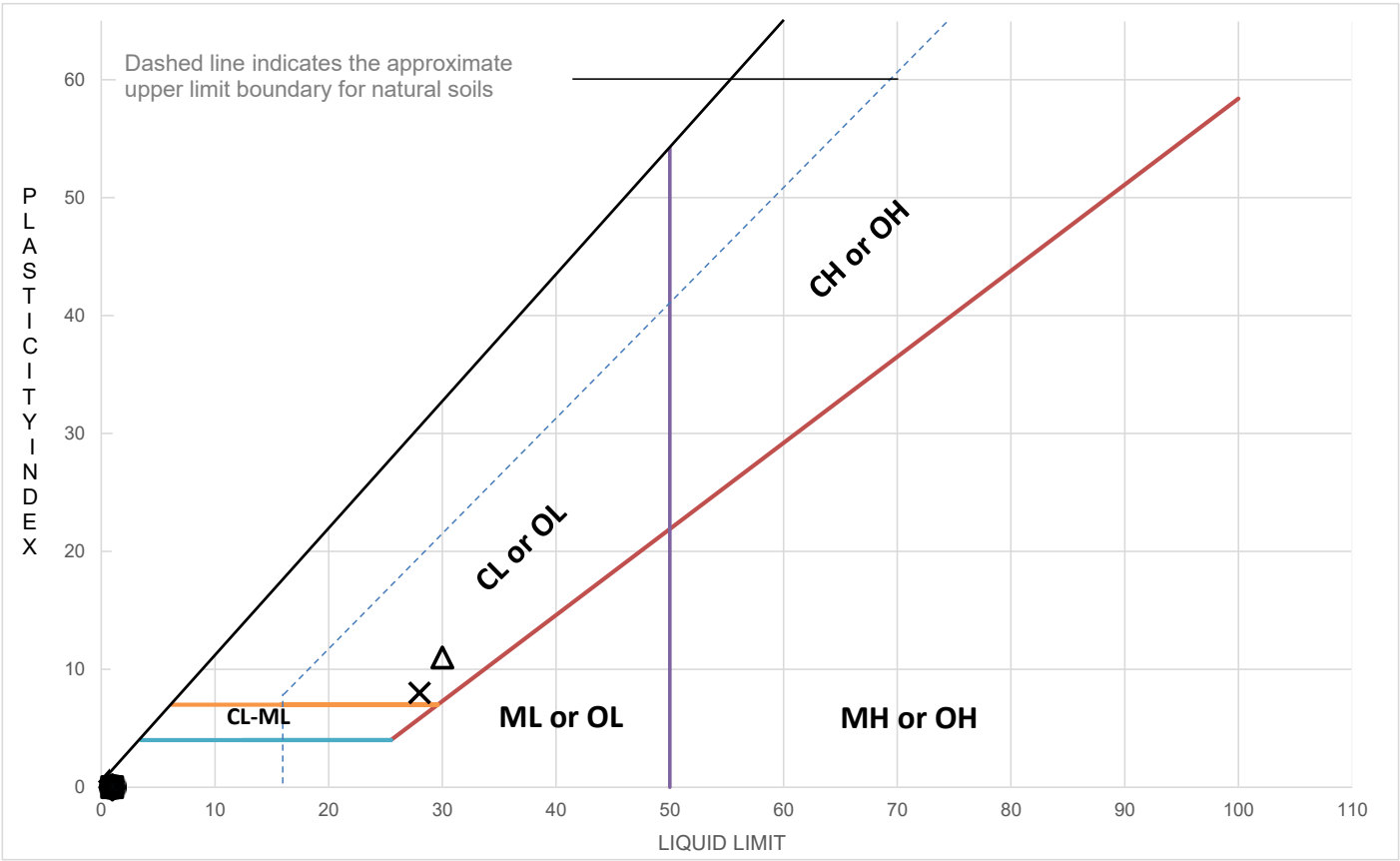
Project: Montgomery Co. Fire Training Building
Client: MW Studios
Sample Description: Brown Sandy Silt
Sample Source: TP-04

Project No.: 44:2244
Depth (ft): 1.0 - 1.5
Sample No.: S-1
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received	Remarks
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026	

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-01	S-3	4.00-6.00	NP	NP	NP	68.4	48.3	A-4	SM	Light Brown Silty Sand with Gravel
◆	B-02	S-3	4.00-6.00	NP	NP	NP	25.8	17.7	A-1	GM	Light Brown Silty Gravel with Sand
▲	B-03	S-4	6.00-8.00	NP	NP	NP	15.0	10.7	A-1	GP-GM	Brown Poorly Graded Gravel with Sand
●	B-04	S-4	6.00-8.00	NP	NP	NP	36.1	17.2	A-1	SM	Brown Silty Sand with Gravel
✳	B-06	S-6	13.00-15.00	NP	NP	NP	83.1	38.1	A-4	SM	Organgish Brown Silty Sand
⊗	B-07	S-3	6.00-8.00	NP	NP	NP	71.1	39.5	A-4	SM	Dark Brown Silty Sand
□	B-07	S-4	8.00-10.00	NP	NP	NP	65.5	42.3	A-4	SM	Brown Silty Sand
◇	TP-01	S-1	2.00-2.50	NP	NP	NP	65.7	49.7	A-4	SM	Brown Silty Sand with Gravel
△	TP-02	S-1	1.00-1.50	30	19	11	62.7	47.7	A-6	SC	Dark Brown Clayey Sand
×	TP-03	S-1	1.00-1.50	28	20	8	60.2	47.1	A-4	SC	Brown Clayey Sand

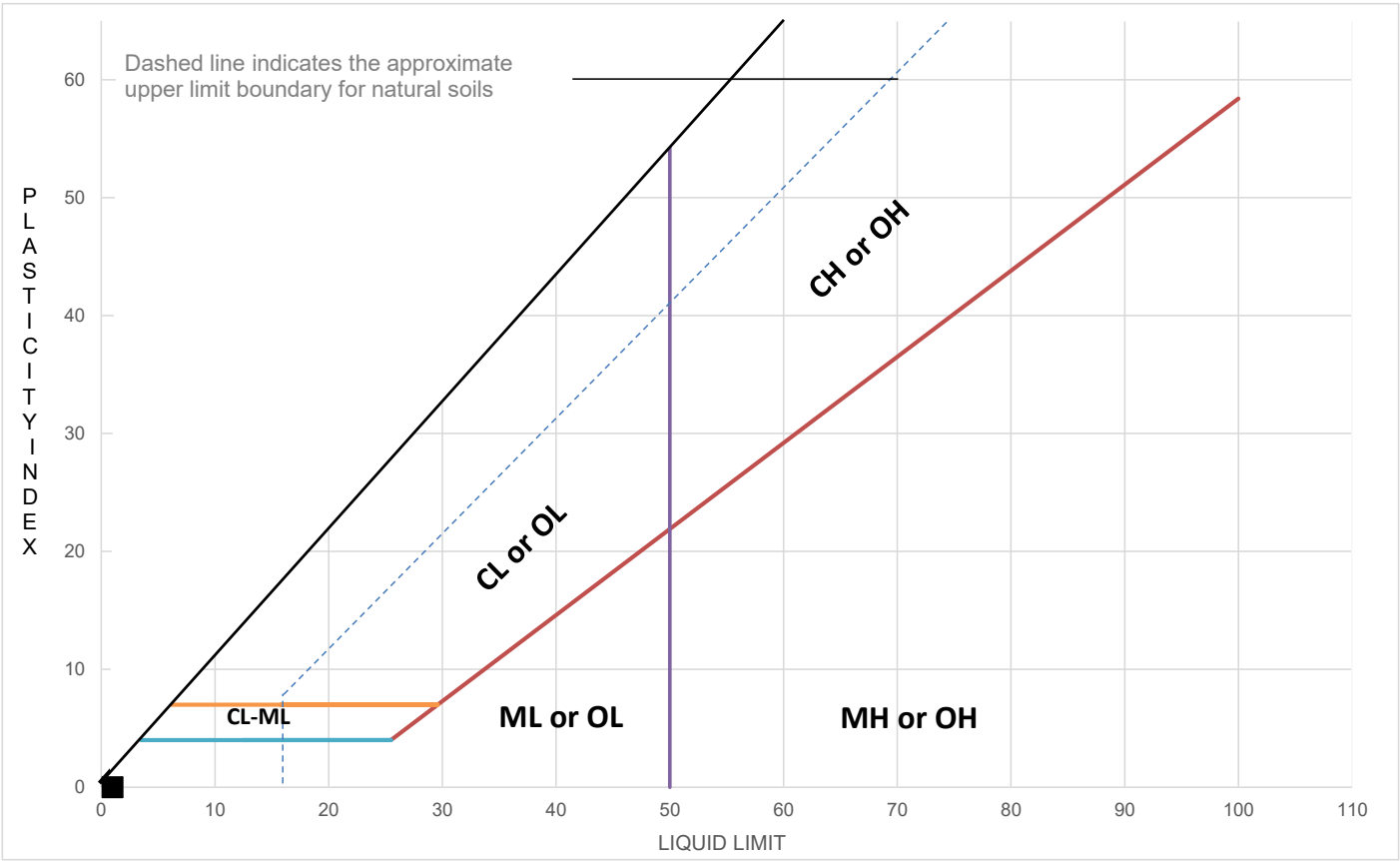
Project: Montgomery Co. Fire Training Building
Client: MW Studios

Project No.: 44:2244
Date Reported: 3/5/2026

Office / Lab	Address	Office Number / Fax
ECS Mid-Atlantic LLC - Philadelphia	11000 Commerce Pkwy, Suite B Mount Laurel New Jersey 08054	(609)832-3910 (484)840-5586

Tested by	Checked by	Approved by	Date Received
R.Quitinsky	J.Gross	R.Peddishree	2/27/2026

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	TP-04	S-1	1.00-1.50	NP	NP	NP	69.4	52.9	A-4	ML	Brown Sandy Silt

Project: Montgomery Co. Fire Training Building
Client: MW Studios

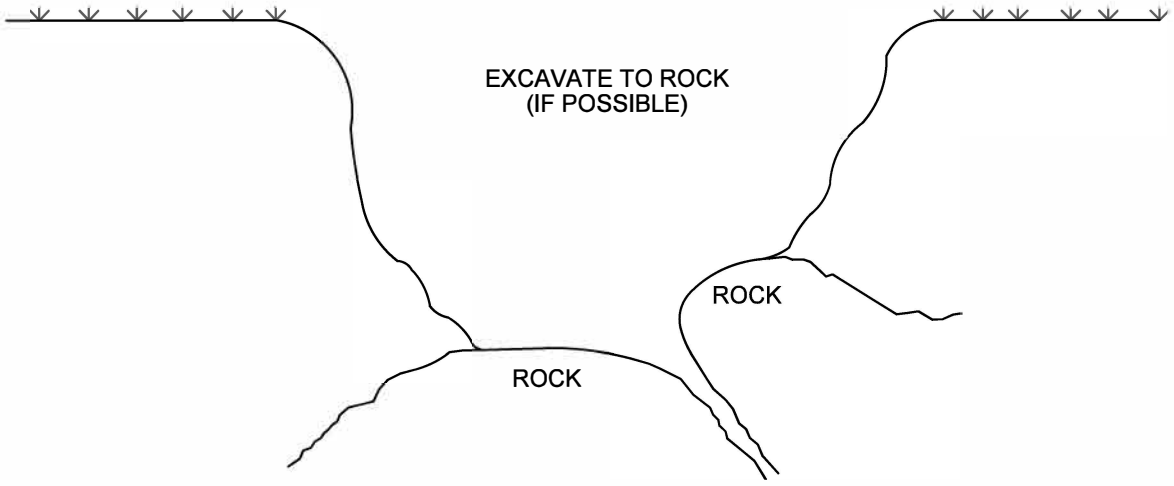
Project No.: 44:2244
Date Reported: 3/5/2026

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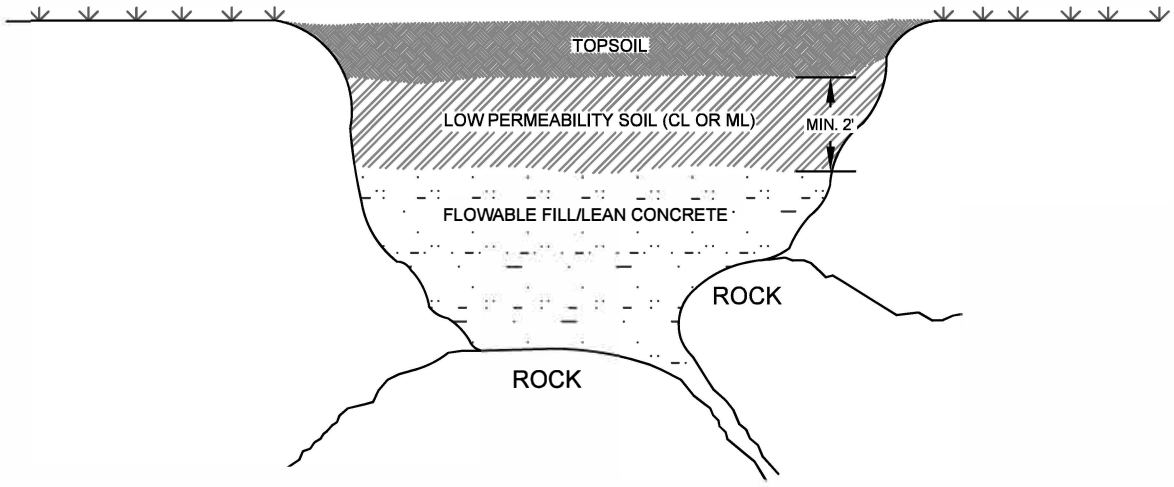
Appendix D – Supplemental Documents

Sinkhole Repair Details



STEP 1: EXCAVATE THE SINKHOLE DOWN TO ROCK, IF POSSIBLE.

STEP 2: CLEAN OUT ALL LOOSE SOIL AND EXPOSE THROAT, IF POSSIBLE.



STEP 3: PLACE FLOWABLE FILL/LEAN CONCRETE APPROXIMATELY 2 TO 3 FEET ABOVE THE THROAT OR AS NEEDED.

STEP 4: COMPACT LOW PERMEABILITY SOIL (CL OR ML MATERIALS) OVER FLOWABLE FILL/LEAN CONCRETE TO A MINIMUM THICKNESS OF 2 FEET.

- SOILS SHOULD BE COMPATIBLE WIH THE ON-SITE SOILS.

- COMPACT TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY (MDD) AS OBTAINED BY ASTM D698 (OR 92% OF THE MDD AS OBTAINED BY ASTM D1557) OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER.

STEP 5: FILL THE REMAINDER OF THE HOLE WITH SOIL TO MATCH GRADE. THIS CAN BE LAYERED TO MATCH THE EXISTING SOIL PROFILE.

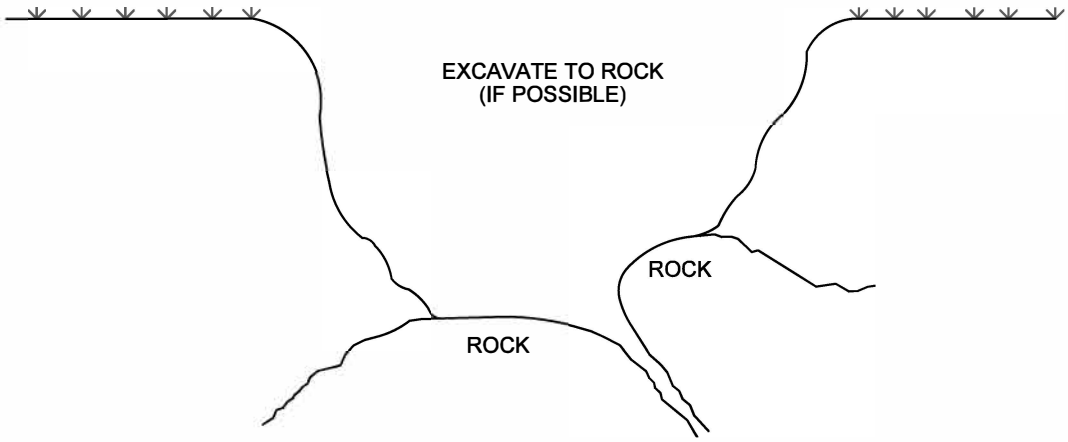
NOTE: ALL SINKHOLE REPAIRS SHOULD BE PERFORMED UNDER THE SUPERVISION OF A GEOTECHNICAL ENGINEER EXPERIENCED WITH CARBONATE GEOLOGY AND SINKHOLE REPAIR PROCEDURES. DETAILS CAN BE MODIFIED AT THE DESCRETION OF THE GEOTECHNICAL ENGINEER BASED ON THE ENCOUNTERED CONDITIONS.POSITIVE DRAINAGE AWAY FROM THE OPEN EXCAVATION SHOULD BE MAINTAINED.

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MOUNT LAUREL, NJ 08054
(609) 832-3910

TYPICAL SINKHOLE REPAIR DETAIL

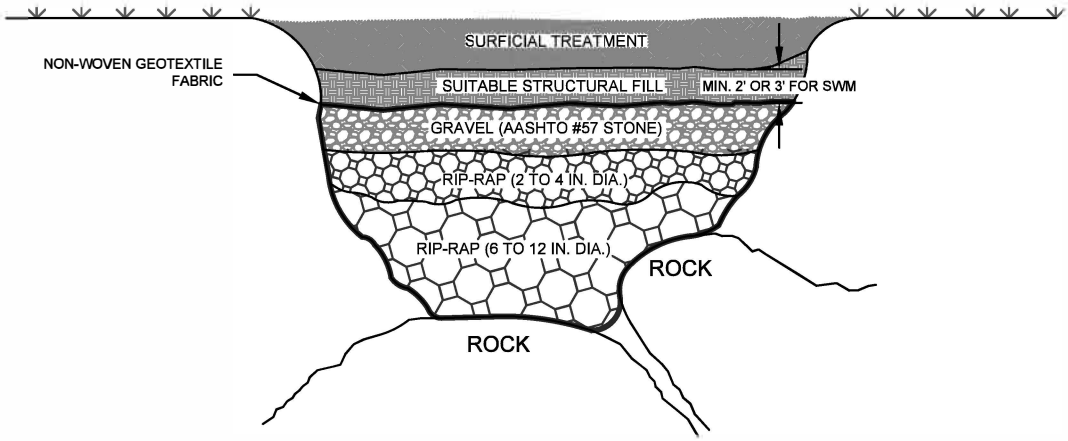
GROUTED REPAIR

NOT TO SCALE



STEP 1: EXCAVATE THE SINKHOLE DOWN TO ROCK, IF POSSIBLE.

STEP 2: CLEAN OUT ALL LOOSE SOIL AND EXPOSE THROAT, IF POSSIBLE.



STEP 3: LINE THE EXCAVATION WITH NON-WOVEN GEOTEXTILE FABRIC (MIRAFI 140N OR EQUIVALENT.)

STEP 4: PLACE A LAYER OF LARGE STONE IN THE EXCAVATION. STONE SHOULD BE APPROXIMATELY 6 TO 12 INCHES IN DIAMETER.

STEP 5: PLACE A LAYER OF SMALLER STONE ON TOP. THIS LAYER SHOULD CONSIST OF STONES APPROXIMATELY 2 TO 4 INCHES IN DIAMETER.

STEP 6: PLACE A LAYER OF GRAVEL ON TOP OF THE SMALLER STONES. THE GRAVEL SHOULD BE AASHTO #57 STONE OR EQUIVALENT.

STEP 7: COVER THE GRAVEL WITH THE GEOTEXTILE FABRIC. THIS WILL PREVENT THE FINES FROM THE NEXT LAYER FROM BEING LOST IN THE VOID SPACE OF THE GRAVEL/STONE.

STEP 8: PLACE A MINIMUM OF 2 FT OF SUITABLE STRUCTURAL FILL ON TOP OF THE GEOTEXTILE FABRIC. FOR REPAIRS IN STORMWATER MANAGEMENT FACILITIES USE A MINIMUM OF 3 FT OF SUITABLE STRUCTURAL FILL. COMPACT TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY (MDD) AS OBTAINED BY ASTM D698 (OR 92% OF THE MDD AS OBTAINED BY ASTM D1557.)

STEP 9: FILL THE REMAINDER OF THE HOLE WITH SOIL TO MATCH GRADE. THIS CAN BE LAYERED TO MATCH THE EXISTING SOIL PROFILE.

NOTE: IDEALLY EACH LAYER IS APPROXIMATELY 6 INCHES TO 2 FEET THICK; HOWEVER, THICKER LAYERS ARE SOMETIMES WARRANTED DEPENDING ON THE DEPTH OF THE FEATURE.ALL SINKHOLE REPAIRS SHOULD BE PERFORMED UNDER THE SUPERVISION OF A GEOTECHNICAL ENGINEER EXPERIENCED WITH CARBONATE GEOLOGY AND SINKHOLE REPAIR PROCEDURES. DETAILS CAN BE MODIFIED AT THE DESCRETION OF THE GEOTECHNICAL ENGINEER BASED ON THE ENCOUNTERED CONDITIONS. POSITIVE DRAINAGE AWAY FROM THE OPEN EXCVATION SHOULD BE MAINTAINED.

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(609) 832-3910

TYPICAL SINKHOLE REPAIR DETAIL

STONE TYPE REPAIR

NOT TO SCALE

SECTION 010600 - MOBILIZATION/DEMOBILIZATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

This work shall consist of the assembling/disassembling and setting up/tearing down for the project, the Contractor's necessary general plant, including field office, shops, plants, storage areas, project sign, sanitary and any other facilities, as required by the specifications and special requirements of the contract, as well as by local or State law and regulation. The determination of the adequacy of the Contractor's facilities, except as noted above, shall be made by the Contractor. The cost of required insurance and bonds and/or other initial expenses required for the start of work, including any required permitting costs such as building and zoning permits, will be included in this item.

This work also includes any required pedestrian and vehicular traffic protection and maintenance, including signage, flagging, temporary accesses, barriers, etc.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

The Contractor shall furnish all materials and furnishings required for this item. These materials and furnishings will not be considered as a part of the various items of the completed contract.

The Contractor shall provide all tools, equipment, materials, labor and work for the construction and furnishings of the required facilities and services. All work under this item shall be performed in a safe and workmanlike manner.

END OF SECTION 010600

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. Contract Description
3. Work by Owner
4. Owner Furnished/Contractor Installed (OFCI) Products
5. Owner Occupancy
6. Contractors Use of Site
7. Work Restrictions
8. Specifications and Drawing Conventions
9. Miscellaneous Provisions

1.3 PROJECT INFORMATION

A. Project Name: Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township.
1. Project Location: 1175 Conshohocken Road, Conshohocken, Pennsylvania19428.

B. Owner's Name: Montgomery County.
1. Owner's Location: P.O. Box 311, Norristown, Pennsylvania19404.

C. Architect's Name: MW Studios.
1. Architect's Location: 8098 Sandpiper Circle, Suite H, Nottingham, Maryland 21236.

D. Construction Manager as Advisor (CMa): Boyle Construction Inc.
1. Construction Manager as Advisor has been engaged for this Project to serve as an advisor to the Owner and to provide assistance in administering the Contract for Construction between the Owner and each of the Prime Contractors, according to a separate contract between the Owner and the Construction Manager as Advisor.
2. The Construction Manager as Advisor is indicated throughout these specifications as CMa and/or Construction Manager; both are synonymous and refer to the Construction Manager as Advisor.

E. Additional Project contact information is specified in Section 00 0103 - Project Directory.

F. The Work of the Project is defined by the Contract Documents and generally includes, but is not limited to, the following:

1. The Project generally consists of the site modifications and building construction outlined within the Contract Documents to construct three new structures located within an existing emergency services training campus. Building 1 (B1), approximately 5,845 square feet, six stories, and Building 2 (B2), approximately 3,440 square feet, three stories, consist of conventional masonry and concrete with special mix designs to mitigate water infiltration and resist heat; sloped floors to drain suppression water; depressed floors in burn room locations to receive fire brick; ceilings, walls and structural elements to receive thermal lining protection system of refractory tile or insulating calcium silicate boards; doors and window shutters constructed of galvanized steel;various dedicated rooms within the training tower to receive Class B burn props; centrally controlled sound effects system; synthetic smoke generating equipment; dedicated anchor points for rappelling training and safety; with facades designed to replicate both commercial and residential structures. Building 3 (B3), approximately 770 square feet, is a partially enclosed recovery pavilion consisting of a pre-engineered metal building structure.
2. Phased Construction
    a. The project will be constructed in a single phase.

G. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage of this Project.
1. See Section 01 3000 - Administrative Requirements for requirements for obtaining and utilizing web-based Project Software.

1.4 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts each based on a Stipulated Price. Project will be constructed under coordinated, concurrent multiple contracts. See Section 01 1010 - Multiple Contract Reference and Description Summary for a description of work included under each of the multiple contracts. Prime Contracts for this project include the following:
1. General Contractor; GC-01.
    a. This contract shall generally consist of all general building and site construction, fire training simulation systems and limited Mechanical Work associated with the live fire training systems.
2. Plumbing Contractor; PC-22.
    a. This contract shall generally consist of all Plumbing Work and other Work located on site and within the building(s) including, but not limited to, domestic water supply, fire protection water supply, and facility gas supply (vapor and liquid).
3. Electrical Contractor; EC-26.
    a. This contract shall generally consist of all Electrical Work and other Work located on site and within the building(s) including, but not limited to, electric power supply, interior lighting, exterior lighting, site lighting, data/fiber optic service, and lightning protection systems and equipment.

1.5 WORK BY OWNER

A. General: This Article, Work By Owner, is intended to discuss activity performed under contracts outside of the multiple prime contracts indicated within the previous article to which these specifications apply.

B. Cooperate fully with Owner/Owners Contractors, so work may be carried out smoothly, without interference with or delaying Work under this Contract or work by Owner/Owners Contractors. Coordinate the Work of this Contract with work performed by Owner/Owners Contractors.

C. Preceding Work: Owner will perform the following operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.
   1. Fire supply line replacement and hydrant location.

1.6 OWNER FURNISHED/CONTRACTOR INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
   1. Provide to Contractor Owner reviewed Product Data, Shop Drawings, and Samples.
   2. Provide for delivery of Owner furnished products to Project Site.
   3. Upon delivery, the Owner will inspect, with the Contractor present, the delivered item(s).
      a. If Owner furnished products are damaged, defective, or missing, the Owner will arrange for replacement.
   4. Owner will obtain manufacturer's inspections, service, and warranties.
   5. Owner will inform the Contractor of earliest available delivery date for Owner furnished products.

B. Contractors Responsibilities: The Work includes the following, as applicable:
   1. Identify delivery dates of Owner furnished products in Contractors construction schedule, utilizing Owner furnished earliest available delivery dates.
   2. Review Owner reviewed Product Data, Shop Drawings, and Samples noting discrepancies and other issues in providing for Owner furnished products in the Work.
   3. Receive, unload, handle, store, protect, and install Owner furnished products.
   4. Make building services connections for Owner furnished pro
   5. Protect Owner furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
   6. Repair or replace Owner furnished products damaged following receipt and prior to Substantial Completion.

C. Owner Furnished Contractor Installed (OFCI) Products:
   1. Items shall be as indicated on drawings.

1.7 OWNER OCCUPANCY

A. Full Owner Occupancy: Owner will occupy Project site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Schedule/Perform the Work so as not to interfere with Owners day-to-day operations.
   1. Maintain existing exits unless otherwise indicated.
   2. Maintain access to walkways, corridors, or other occupied or used facilities. Do not close or obstruct walkways, corridors, other other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
   3. Notify Owner not less then five business days in advance of activities that will affect Owners operations.

B. Owner intends to occupy the Project upon Substantial Completion.

1.8 CONTRACTOR USE OF SITE AND PREMISES

A. Restricted Use of Site: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section. Site use shall be coordinated with the Site Staging and Logistics Plan.
   1. Limits on Use of Site: Limit use of Project site to areas within Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   2. Construction Operations: Limited to areas noted on Drawings.
   3. Construction Personnel Parking:
      a. Construction personnel may be allowed to utilized portions of Project site for parking personal vehicles.
   4. Material Storage and Fabrication Areas: Limit material storage and fabrication areas to those areas indicated on drawings or as directed by Owner/Architect. Schedule deliveries and fabrication times to minimize time requirements and space requirements within the designated areas.

B. Driveways, Walkways and Entrances: Keep driveways, loading zones/areas, entrances, and walkways serving premises clear and available to Owner, Owner's employees, and emergency services at all times. Do not use these areas for parking or for storage of materials.
   1. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Arrange use of useable/allowable portions of site and premises to facilitate:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hard scaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.9 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
   1. Comply with limitations on use of Project site and premises.
   2. Comply with limitations on use of public streets, work on public streets, rights of ways, and other requirements of authorities having jurisdiction.
   3. Provide access to and from site as required by law, by authorities having jurisdiction, and by the Owner.
   4. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   5. Existing building spaces may not be used for storage.

B. Time Restrictions: Normal working hours shall be limited to the time between 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
   1. Weekend Hours: Restricted to Owner Approval; Provide minimum 5 days notice to Owner.
   2. Early Morning Hours: Restricted to Owner Approval; Provide minimum 5 days notice to Owner.

3. Evening and Overnight Hours: Restricted to Owner Approval; Provide minimum 5 days notice to Owner.
4. Work in Existing Building: Restricted to Owner Approval; Provide minimum 5 days notice to Owner.

C. Utility Outages and Shutdown:
1. Limit disruption of utility services to hours the site is unoccupied.
2. Prevent accidental disruption of utility services to other facilities and adjacent sites.

D. Smoking and Controlled Substances
1. Smoking and Controlled Substances: Use of tobacco products, alcoholic beverages, and other controlled and illegal substances on Owners property is not permitted. Workers found using these substances will be immediately removed from the site and will not be allowed back on the project or premises.

E. Weapons
1. Weapons including, but not limited to, firearms, mace, and explosives aree prohibited on the site. Any person found with weapons will be permanently removed from the premises and the project.

F. Employee Identification and Screening
1. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
2. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
   a. Maintain list of approved screened personnel with Owner's representative.

1.10 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. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Bold and Underlined Text: Text that is bold, underlined or both is not intended to insinuate text of greater importance than text that is not underlined or bold or both. This text is bold or underlined or both to provide an additional navigation indictor similar to the outline formatting found in the general specification format.
4. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
5. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. 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 typically identified by the typical generic terms used in the individual Specifications Sections. Some products and materials may defined on the Drawings.
   2. Abbreviations: Materials and products may be identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard. Where discrepancies exist between the drawings and the U.S. National CAD Standards, the drawings shall prevail.
   3. Keynoting: Materials and products may be identified by reference keynotes referencing Specification Section numbers found in this Project Manual/Specification.

1.11 MISCELLANEOUS PROVISIONS

A. Contractors shall be responsible for ensuring all sub-contractors contracted to perform a portion of the Work have possession of ALL CONTRACT DOCUMENTS. Sub-contractors shall be responsible for reviewing all Contract Documents including but not limited to Drawings and Specifications and providing all items outlined within the documents to be provided along with all connections, systems, supports, and miscellaneous items required for the items to function properly as intended.

B. Drawing Coordination: Generally, requirements for materials and products identified on the Drawings are described in detail within the Specifications. However, items may be indicated either only on the Drawings or only within the Specifications. If items are indicated in one document only, it shall be the responsibility of the Contractor to provide the item indicated along with all the components, connections, systems, supports or other miscellaneous itesm required for the proper operation and installation of the items identified within the single document.

C. References within the Drawings and/or Specifications to other Drawings and/or Specifications indicates the potential existance of additional information. If no additional information exists within the referenced drawing(s) or specification(s), the Contractor shall remain responsible for the installation of the Work indicated or graphically depicted. Where Work typically would be structural or load bearing in nature, the Contractor shall provide reinforcement, bracketing, bracing, or otherwise attach such Work as indicated within similar details existing within the Drawings and/or Specifications. It is also the Contractors responsibility to seek clarification for such items prior to submitting a bid to perform the Work. If no clarification is requested for such submission of a bid, it shall be deemed that the Contractor understands the extent of Work both indicated and graphically depicted and has included such within the Contract Sum.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 1000

SECTION 01 1010 - MULTIPLE CONTRACT REFERENCE AND DESCRIPTION SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. **This Section is not intended to provide an all inclusive outline of requirements of each Prime Contract of the Project.**

B. Section includes a general summary of requirements for all Prime Contractors as well as for each prime contract. The general summaries of requirements are organized as follows:
1. General Scope of Work; Applicable to all Contractors.
2. Contract No. GC-01: General Contract Package
3. Contract No. PC-22: Plumbing Contract Package
4. Contract No. EC-26: Electrical Contract Package

1.2 DEFINITIONS

A. Construction Manager as Advisor (CMa): Referred to herein as CMa and/or Construction Manager as Advisor, Construction Manager, CM. See 01 1000 - Summary for additional information.

1.3 CMA (CONSTRUCTION MANAGER AS ADVISOR) GENERAL RESPONSIBILITIES

A. The CMa's coordination activities include, but are not limited to, the following:
1. Facilitate overall coordination of the Work. Prime Contractors remain solely responsible for coordinating the Work of their Contract with the CMa and ensuring coordination with other Prime Contractors.
2. Coordinate, schedule, and facilitate approval of interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
3. Facilitate coordination and completion of interrelated punchlist items.
4. ***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.***
5. Coordinate preparation of operation and maintenance manuals if information form more than one contractor is to be integrated with information from other contractors to form one combined record.

1.4 GENERAL SCOPE OF WORK; APPLICABLE TO ALL CONTRACTORS

A. This General Scope of Work applies to all contractors working on the Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township Project. The scope of work shall include but is not limited to the following requirements as they apply to the Work of each Contract Package unless specifically noted otherwise.

B. Extent of Contract:

1. Unless the Agreement contains a more specific description of the Work of the Contract, the requirements indicated by the Contract Documents including but not limited to the Drawings, Specifications, Addenda, and executed modifications to the contract, determine which contract includes a specific element of the Work of the Project.

C. Each Contractor will provide all labor, supervision, material, tools, equipment, shop drawings, submittals, layout, unloading, storage, handling, scaffolding, ladders, hoisting, transportation, permits, engineering, support functions, insurance, bonds, and other items or services necessary for and reasonably incidental to the proper execution and completion of the work, whether temporary or permanent, in accordance with the Contract Documents including, but not limited to, all drawings, specifications, addenda, general conditions, and other referenced and related documents as indicated herein and within the project contract and procurement documents.

D. It is the responsibility of each contractor to review and understand all the Contract Documents provided whether included within their Contract Package or another Contract Package. **All Contract Documents including but not limited to the Drawings, Specifications, and supplemental information are part of each contract.** Every Contract Document contains critical information for the coordination and completion of the Work of the Project. Where specifications, drawings, or other information provided contain conflicting information, the provisions, terms, and conditions of the more stringent shall take precedence.

E. The following list of specifications and drawings are not intended to be an all inclusive outline of requirements that apply to every Contract Package, but serve as a general reference. Contractors shall be responsible for and comply with the requirements and information within all procurement and contracting documents and other documents indicated within the Invitation to Bid and the following:
1. Specifications:
    a. All specification sections within the Project Manual/Specification Book(s) within the following Divisions (See 00 0010 - Table of Contents for sections within each Division):
        1) Division 00 -- Procurement and Contracting Requirements
        2) Division 01 -- General Requirements
2. Drawings
    a. All "GENERAL/CODE" "G" series drawings within the DRAWING INDEX located on Sheet G000 "COVER SHEET" of the separately bound drawing set titled Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township dated May 21, 2026, as modified by subsequent Addenda and Contract Modifications.

F. Where the Contract Documents indicate a scope of work to be the responsibility of more than one Prime Contractor, each Prime Contractor shall be responsible for including the Work within their Contract Sum and Contract Time (Schedule). Each Prime Contractor shall be responsible for notifying the Architect, CMa, and the Owner of the overlapping Scope of Work, and the Architect, CMa, and Owner shall determine which Prime Contractor shall perform the Work and which Prime Contractor shall provide a credit contract modification (Change Order) for the overlapping Scope of Work.

G. Project Administration
1. Labor Disputes and Jurisdictional Claims
    a. Each Prime Contractor is responsible for resolving labor disputes and jurisdictional claims for all work associated with their contract package. 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.

2. Submittals
    a. Contractors will provide copies of their submittal schedule to all other contractors, the Owner and the Architect, Construction Manager in conjunction with and coordinated with the overall project schedule.
    b. Contractors will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule. Adjustment to the Contract Sum or Contract Time will not be considered or approved for delays related to material delays as a result of the submittal submission or processing.
    c. MSDS sheets for all materials must be submitted with the submittals and prior to start of work.
    d. Contractor will provide copies of approved shop drawings to other contractors that require coordination with the work.
3. Daily Construction Reports
    a. Daily Construction Reports shall be completed by the CMa and uploaded to the web-based project management software. Each Prime Contractor shall cooperate with the CMa and is required to provide all requested information to accurately describe work taking place for that day as well as manpower and inspections associated with each contractor. The CMa will verify the information provided by each contractor to ensure details are accurately documented. Payments may be withheld as a result of failure to cooperate with the CMa in developing and submitting these reports.
4. Site Conditions Reports
    a. Submit at time of discovery of differing conditions. All Prime Contractors are responsible to review the project conditions prior to starting their Work. Contractors shall report prior to the start of work any differing conditions and/or damages part of existing materials that are existing to remain. Issues that are not reported will be the responsibility of the Prime Contractor.
5. Substitutions:
    a. Each Contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the Work.
6. Damage of Existing Conditions or Installed Work
    a. The cost of repairs to any permanent or temporary work in place or existing finishes will be borne by the Contractor responsible for the damage.
        1) When incidental construction damage to a Contractor's work and/or equipment occurs and a responsible party is unable to be identified, the damage shall be repaired by the original installing/providing Contractor who shall assume the cost of such repair. If responsible parties for the incidental damage can be identified, cost shall be borne by them accordingly.

H. Project Coordination
1. All Prime Contractors shall each be fully responsible for the coordination of the work performed by their own forces and those of their contractors. Each of these Contractors is also responsible to cooperate with each other and with the CMa to coordinate the entire work insofar as their individual work affects the work of the others and the project as a whole.
    a. See Section 01 3000 - Administrative Requirements and 01 3216 - Construction Progress Schedule for LEAN PROCEDURES which includes requirements for participation in specification coordination and scheduling activities.
2. Field measurements and verification of installed and existing conditions and elevations. The Contractor shall promptly notify the Architect, Construction Manager whether or not proposed dimensions are required to be guaranteed to ensure timely delivery of materials. If there is a conflict between drawings or specifications, the contractor is responsible for the most costly option.

I. Scheduling
   1. Refer to specific requirements listed in Section 01 3216 - Construction Progress Schedule.
   2. The CMa shall be responsible for developing and managing the Baseline schedule and monthly updates.
      a. Each Prime Contractor shall coordinate the scheduling activities of their Work and to assist in the preparation of an overall project schedule.
      b. Each Prime Contractor shall be fully responsible for the development and maintenance of a project schedule associated with their own Work, updated as required to coordinate with the overall project schedule and as requested by the CMa; at a minimum schedules will be updated monthly unless indicated otherwise.
      c. The schedule shall be established so that conflicts are avoided and that the expeditious progress of the project is not hampered. Major coordination milestones shall be included within the schedule as separate items. The overall project draft schedule shall be distributed to all Prime Contractors, the Architect, CMa and the Owner. Each Prime Contractor must complete, sign and return to the CMa"Project Schedule Acceptance Form" within two (2) business days of receipt of the schedule.
      d. Non-compliance by any Prime Contractor with the agreed upon schedule that results in delays of the project schedule and results in additional time expenditure and/or additional Work for any other Prime Contractor shall result in a Change Order to the offending Prime Contractor. It shall be the responsibility of the affected Prime Contractors to provide proof of delay resulting in additional time and Work as back-up upon issuance of a Change Order Request for the delay caused by another Prime Contractor. The Change Order Requests accompanied by acceptable back-up from the affected Prime Contractors shall be the basis to establish the Change Order issued by the Owner to the offending Prime Contractor.
   3. All work, or applicable portions of the work, shall be sufficiently complete as required for Owner's fit-out, use and occupancy and all required approvals and permits for use and occupancy shall have been issued by the appropriate authorities by the established "Date of Substantial Completion" of the work, or applicable portion thereof.
   4. All punchlist work, and project closeout shall be completed and approved by the Owner and Architect, Construction Manager by the "Date of Final Completion" which shall be no later than thirty (30) calendar days (or earlier per specifications) after the Date of Substantial Completion. Any uncompleted punchlist items after this date will be completed by the Owner and back-charged to the appropriate contractor or vendor including time and expenses spent by the Owner to complete the Work. Final invoices will not be processed until final completion of the work and certification of same by the Owner and the Architect, Construction Manager.
   5. The Construction Manager will monitor the progress of the Work and will meet and confer with the contractor to determine whether or not they are on schedule. If the Construction Manager determine that the contractor is not on or ahead of schedule:
      a. The contractor will be notified that they have fourteen (14) calendar days to expedite their work to get back on the schedule.
      b. The Owner will not make any further payments until the contractor is back on schedule.
      c. If at the end of fourteen (14) days the contractor is still not on schedule, they and their bonding company will be notified that they are in imminent Breach of Contract and the Owner will obtain the work on the open market. The Owner will deduct the amount charged by the alternate company from any monies due to or which may become due from the contractor.
   6. Contractor must maintain sufficient manpower to meet schedule and avoid delay to other phases or contractors.

J. Sequencing, Mobilization, Demobilization
1. Contractors will be responsible for the mobilization and demobilization of construction forces, equipment, temporary facilities and controls based upon the sequencing and organization of the project schedule. No adjustment to Contract Sum or Contract Time will be approved for mobilization and demobilization based upon coordinated project schedule.

K. Licensing, Certification, Regulations, and Code Compliance
1. Prime and sub-tier contractors are required to be licensed, and allowed to perform work within all jurisdictions in which the Project exists, including but not limited to the State of Pennsylvania, Montgomery County, and Plymouth Township.
2. Each Contractor must be fully knowledgeable of all applicable Montgomery County, Plymouth Township, Pennsylvania Department of Transportation (PennDOT) and Manual on Uniform Traffic Control Devices (MUTCD) requirements and will comply with same throughout the duration of this project.
3. Contractors will comply with all federal and local codes, ordinances, regulations, and laws as may be required by the Plymouth Township, Montgomery County, the state of Pennsylvania, the United States, and/or any local authority having jurisdiction.

L. Permits
1. Contractors will be required to apply for, pay for, and ultimately obtain all permits required to complete the Scope of Work of their Agreement/Contract with the exception of the general building permit. Required permits may include, but are not limited to, street and sidewalk closures and utility tie-ins. Owner will be responsible for the cost of the general building permit. Contractor is responsible to fill out necessary forms, submit to the AHJ and file after Award of the Project.

M. Site Access
1. Construction personnel shall use designated entrance and egress areas to the project site as directed by the CMa and Owner. Contractors shall not block or impede entry roads, drives, or other pedestrian or vehicular paths.

N. Project Layout and Stakeout
1. Each Contactor is to provide layout/stakeout as required to perform their Work. Initial vertical control (at minimum of two locations on site) will be provided as part of the specific scope of work under the General Construction Contract Package GC-01. Contractors shall take precautions when completing layout work by thoroughly verifying sizes and locations of proposed equipment, services and building components such as walls, ceilings, etc. The Contractor shall review and compare multiple strings of dimensions, when shown in the drawings, to minimize layout and drawing discrepancies. Ambiguities, errors, or any inconsistency in the drawings shall be brought to the attention of the Architect, Construction Manager. Each Contractor is responsible for reviewing information/literature on equipment being supplied by other Contractors and the Owner in order to coordinate the completion of the work.

O. Temporary Facilities and Controls
1. Contractors will provide, maintain, and remove when directed, all temporary construction and temporary provisions indicated. Within 5 calendar days following date of Notice to Proceed, Contractor will submit all required applications and accompanying documentation to the authority having jurisdiction, to obtain any permits required for the installation and/or operation of temporary facilities and/or controls required to perform the Scope of Work of their Contract Package.

2. Parking
    a. Parking within the Project site (training grounds) is limited and shall be reserved for vehicles required for direct and immediate construction operations. All vehicles not directly associated with the performance of construction activities may be allowed to park within designated areas outside of the training grounds pending approval of the CMa and Owner. All parking requests shall be submitted to the CMa and reviewed with the Owner for approval. All vehicle access, circulation, and parking are subject to compliance with the Site Staging and Logistics Plan.
3. Delivery, Storage, and Staging:
    a. On-Site (within the training grounds): There is limited storage area for materials; Contractors shall assume "Just-in-Time" deliveries for materials and equipment. Only materials that will be used within a two-week period from delivery will be permitted to be stored on site. Storage requirements, space and location, shall be coordinated with the Site Staging and Logistics Plan and approved by the CMa and the Owner.
    b. All materials and equipment shall be delivered to the site and stored at locations coordinated the Site Staging and Logistics Plan and with all other Contractors. Each Contractor shall be responsible for proper care and protection of materials stored on site and shall be responsible for any damage to stored materials. Where stored materials impact or interfere with other contractors work, the contractor responsible for those materials shall be required to remove and relocate materials immediately upon notification of impact or interference.
    c. All deliveries shall be the responsibility of the ordering Contractor. No delivery will be accepted by the Owner, the CMa or other Prime Contractors.
4. Temporary Utilities
    a. Temporary Lighting
        1) Contactors are required to provide their own temporary lighting until temporary lighting system is established and installed. Contractor understands temporary lighting will be provided by the EC-26 Electrical Construction Prime Contractor at the levels required by OSHA. Where additional lighting is required or desired to perform the Work of a Contract Package, the Prime Contractor requiring or desiring additional lighting shall provide such lighting at their own expense.
    b. Temporary Power
        1) Contractors are required to provide their own temporary power until the temporary power distribution system is established and installed by the EC-26 Electrical Construction Prime Contractor per the agreed upon and coordinated project schedule.
    c. Temporary Water Supply
        1) Contractors are required to provide their own water supply for construction activities until temporary water supply connections are established and installed by the GC-01 General Construction Prime Contractor per the agreed upon and coordinated schedule.
        2) Temporary water supply system shall consist of a minimum 1000 gallon tank, engine and minimum 2 inch centrifugal pump system providing a minimum 20 GPM on-demand pressurized water delivery for filling and dispensing water. Tank shall be NSF/FDA compliant for potable water and shall be black or green in color to help prevent the growth of algae. System shall be provided with a minimum of 4 supply outlets, hoses, and nozzles. System shall have thermostat-controlled, insulated freeze protection for pump and plumbing.
    d. Temporary Telecommunications Service
        1) Contractors are required to provide their own telecommunication or mobile services for data transfer and communication as required by Contract Documents.

2) The GC-01 General Construction Prime Contractor will provide wireless telecommunication service with wireless routers located within the common use and CMa 's field office(s).

5. Temporary Sanitary Facilities
   a. The GC-01 General Construction Prime Contractor will provide temporary sanitary facilities for use by all construction personnel as required by the Contract Documents.
      1) Facilities shall be located per the Site Staging and Logistics Plan.
6. In addition to specific responsibilities for temporary facilities and controls indicated within this and other sections of the specifications, each contractor is responsible for the following:
   a. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary for their construction activities and Scope of Work.
   b. Computers, printers and office supplies necessary for its own activities.
   c. Temporary enclosures for its own construction activities.
   d. Temporary weather and dust protection for own work.
   e. Staging and scaffolding for its own construction activities.
   f. Sheeting, shoring, and bracing as required to perform work.
   g. General hoisting facilities for its own construction activities.
   h. Waste disposal tools, bins, and other items for localized collection and transportation of non-hazardous waste to dumpster and recycling containers.
   i. Specialized (hazardous) waste collection and 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 own operations on a daily basis.
   k. Secure lock-up of its own tools, materials, and equipment.
   l. Construction aids and miscellaneous services and facilities necessary for its own construction activities.
   m. Temporary heating and cooling as required for the Work of each contract.
   n. Provide temporary protection of existing and installed work.
   o. Concrete wash out within onsite wash pit. Wash water must not enter storm-water system. Wash-pit shall be provided by GC-01 General Construction Prime Contractor.

P. Testing and Inspections
1. Contractors will provide a minimum of 72 hours notice to the CMa for all required Permit Inspections. The CMa will schedule all required inspections from start of Project to closeout.
2. Contractors are required to provide labor and supervision to assist with all AHJ inspections and specialty inspections.
3. All Prime Contractors superintendents will accompany the AHJ and the CMa during inspections. If re-inspection is required for incomplete work, the responsible Prime Contractor will be required to compensate the CMa and the AHJ for re-inspections.
4. All Prime Contractors shall fully cooperate with any Testing and Inspection agencies retained by Owner, Montgomery County, Plymouth Township, or other AHJ. Cooperation includes, but is not limited to, the execution and/or implementation of any remedial work recommended as a result of such inspections. It will be the responsibility of the Contractors to provide proper coordination and timely notification to the CMa for notification of the testing agency, inspecting authority, or other AHJ entity. Any premium labor costs associates with such inspections will be the responsibility of the Contractor. Contractors shall identify inspection dates on weekly work schedule.
5. All re-inspection costs due to failures and non-conformance will be the responsibility of the Contractor. Any and all specialized testing and/or inspections needed to temporary or permanent construction

methodologies, not described in the Contract Documents, are the responsibility of the appropriate Prime or sub-tier contractor.

Q. Project Closeout
1. Each Prime Contractor shall provide a redlined updated PDF set of drawings of all improvements installed by their Contract as required by the Contract Documents; See Section 01 7800 - Closeout Submittals. Redline updated information shall include, but not be limited to, denoting active and abandoned utilities encountered, and modifications to original design documents denoting actual installations, differing materials, and actual locations of provided construction items.
2. As-builts will be kept by each contractor individually. Each contractor will also be required to input As-built information into the record set kept in the CMa's or common use field office on a weekly basis. A line item will be required in the schedule of values for this activity and will not be approved for progress billing without Owner approval that this task has been completed.

R. UtilityTrenching
1. Trenching Within Building Footprint
   a. Each Prime Contractor shall be responsible for trenching required by the Scope of their Contract Package.
      1) Trenching for utilities within building footprint shall consist of, but is not limited to, excavation to required depths, dewatering/mucking, trench protection (shoring and covering), preparation of trench for utility installation, backfill to subgrade, compaction meeting project requirements, and preparation of subgrade for repair/installation of surfacing materials or assemblies.
2. Trenching for Site Utilities: Site Utilities consist of domestic water supply, fire protection water supply, emergency water supply (hydrants), gas supply (vapor and liquid), sanitary/sewer, electric power, data/fiber optic service, and storm water extending across the site from/to building footprint, site lighting pole bases, and site located equipment, structures, and utility access/control/connection points.
   a. GC-01 General Construction Prime Contractor will provide Site Utility Trenching to depths and widths required for the installation of the utilities to be placed within the trench. Trenching for utilities shall consist of, but is not limited to, notification for utility location, final utility location (test pitting or similar form of physical utility location) , erosion and sediment controls (ESC) and other environmental protections, saw cutting and/or removal of existing pavements (where applicable), excavation to required depths, trench protection (shoring and covering), repair/installation of surfacing materials and/or assemblies, and off-site disposal of excess spoils.
   b. Prime Contractors required to provide Site Utilities as part of their Contract Package shall be responsible for the following trenching activities: dewatering/mucking, trench protection (shoring and covering), preparation of trench for utility installation, backfill to subgrade, compaction meeting project requirements, and preparation of subgrade for repair/installation of surfacing materials or assemblies.
   c. Location and path of site utility trenches shall be direct (straight) lines from building service entrance/exit location to point of termination/origination; from site lighting pole base to site lighting pole base in sequence; from site equipment to point of termination/origination; as indicated within the Contract Documents.
   d. Depth of trenches shall be as required for the proper operation of the utility, as required by any AHJ, and as required by the Contract Documents.

e. Prime Contractors providing site utilities as required by their Contract Package shall coordinate trenching requirements with the GC-01 General Construction Prime Contractor.

S. Scaffolding, Lifts, Cranes and other Hoisting Equipment
1. In accordance with applicable codes and regulations, all hoisting equipment used on site shall have routine maintenance and inspections. Copies of the inspection certificates are to be maintained with the equipment and shall be provided to the Owner, Architect, Construction Manager, or AHJ when requested.

T. Valves, Junction Boxes, and other items requiring access:
1. Training Structures (Live Fire Burn Buildings and Training Towers): Valves, junction boxes and other items requiring access shall be located within control rooms to the greatest extent possible. Where not possible to be located within control rooms or non-training closets, items requiring access shall be located outside of training rooms in locations approved by Architect. Where items are installed in locations not approved by Architect, the installing contractor shall be responsible for relocating such items without adjustment to the Contract Sum or Contract Time. Coordination drawings locating all conduit, junction boxes and other items requiring access within training structures must be provided and approved by the Architect prior to purchase, fabrication, or installation of systems and components and must be coordinated with supporting construction whether included within the contract package or not.
2. Occupied Buildings (Recovery Pavilion): Locate valves, junction boxes and other accessible items above accessible ceilings to the greatest extent possible to avoid the need for access panels. Where access panels are needed, Contractors will provide layout for and supply access panels to the GC-01 General Construction Prime Contractor for installation.

U. Embeds, Blocking, Equipment Anchors, and other Metal Fabrication Supports
1. Prime Contractors will provide all wood or light gauge metal blocking, and backing panels for Work of their Contract Package.
2. Prime Contractors will furnish embedded anchors, sleeves, plates, and other supporting metal fabrications to the GC-01 General Construction Prime Contractor for installation of items within the the GC-01 General Construction Contract Package.
   a. Coordination Drawings locating all embedded anchors, sleeves, plates, and other supporting metal fabrications will be approved by the CMa and Architect and shall be provided to the GC-01 General Construction Prime Contractor for coordination and installation of embedded items.
      1) Coordination Drawings for embeds shall also include, but not be limited to, the following:
         a) Anchoring systems for props, fire trainers, ladders, frames, knock out panels and walls, rappelling tie-offs, gates, hand rails, guard rails, and catwalks.
         b) Mock cabinets, meters, and panels.
         c) Drainage accessories; scuppers, edge angles and retaining angels.
         d) Ductwork, piping, vents, and equipment sleeves and supports.
         e) Miscellaneous structural components; bearing plates, dowels, angles.
         f) Plumbing system components; piping, sleeves, and supports.
         g) Electrical system components; conduit, sleeves, and supports.
         h) Miscellaneous supports, hangers and bracing.
   b. Items shall be provided in accordance with the Project schedule to avoid delays in the Work. Prime Contractors responsible for providing embedded items that do not provide coordinated

drawings of embedded items or not furnishing embedded items shall be responsible for all costs for the post installation of such items as well as any cost of delays.

V. Core Drilling, Cutting and Patching
1. Each Prime Contractor shall be responsible for core drilling, cutting and patching as required to perform work or their contract package. Include restoration of surfaces to original condition. Cutting to be performed in manner to minimize patching.

W. Sealant, Caulking, Firestopping, Acoustic Sealant
1. Each Prime Contractor will provide sealant, caulking, firestopping and acoustic sealant for its own work. Unless specifically shown otherwise in the Contract Documents, each penetration shall be independent and not ganged. All fire stopping and sound sealants shall be performed by certified installers. Firestopping sealants and materials shall be red in color and shall be installed in accordance with listed UL assembly requirements.

X. Construction Cleaning
1. The GC-01 General Construction Prime Contractor will provide and maintain dumpsters and/or recycling containers within the training grounds for use by all contractors. Location of dumpsters and recycling containers shall be coordinated with the Site Staging and Logistics Plan.
2. Each Prime Contractor will remove trash and construction debris **DAILY** throughout the construction duration; provide their own means of transporting such trash and debris to the dumpsters and recycling containers provided; broom sweep work areas **DAILY** at the end of each shift.
3. Any materials or debris that can be windblown must be secured at all times. Contractors must take into account the conditions and potential for high winds as work progresses and take all precautions necessary to prevent items from traveling to other areas of the occupied site. The occupied site is a training facility for emergency services and objects that interfere with training activities have the potential to create dangerous situations that may cause harm to or adversely affect the health and welfare of the occupants of the site and surrounding community.
4. Access pathways shall be kept clean and clear (free of debris).
5. Areas that are not kept clean per the contract requirements or cleaned in a timely manner (**DAILY**) will be cleaned by others, as directed by the CMa at the Prime Contractors expense.
6. Parking areas and work areas shall be magnetically swept daily to minimize the potential of tire damage

Y. General Safety Requirements
1. Each Prime Contractor is fully responsible for all aspects of safety for their Scope of Work including but not limited to supervision, planning, training, project orientations, and coordination with other contractors.
2. Prime Contractors and associated sub-tier contractors working on site shall comply with all applicable government regulations, specific client rules and regulations, and requirements dictated within the Project Contract Documents. If any of these standards, requirements, rules or procedures conflict, the most stringent will prevail
3. It is the responsibility of ALL Prime Contractors to make sure their employees, sub-tier contractors, agents, vendors, and suppliers that are visiting or performing work on site understand all jobsite rules, regulations, safety procedures, and come to the site prepared to complete their scheduled work or activity with clear direction regarding scope of work, and schedule, and are utilizing the most current Contract Documents including any approved modifications.

4. Minimum personal protective equipment (PPE) must be worn at all times within the construction limits of the Project. Minimum PPE shall be as required by OSHA and other AHJ and shall include hard hat, high visibility clothing, cut resistant gloves (min. Level 3), safety glasses and sturdy work boots/foot protection as well as work attire including long pants and long sleeve shirts. ANSI reflectivity requirements must be met when working in traffic and/or at night. It is the Prime Contractor's responsibility to provide additional PPE as required for each task.
5. Each Prime Contractor shall submit a Project Specific Safety & Environmental Plan addressing the hazards of their Scope of Work and mitigation plans to control the hazards. Plan shall be submitted two weeks prior to the start of the Prime's work and shall be reviewed by the CMa and Owner. The format of the PSSP shall follow the template provided by the CMa. Contractors shall refer to the table contained below to reference minimum worker training requirements. The PSSP shall:
    a. Identify each component of the work that the contractor is responsible for completing.
    b. Identify hazards associated with the work and the proper equipment and tools to perform the Work.
    c. Plan adequate and sufficient controls to protect their work.
    d. If the project specific safety plan needs revision due to scope of work changes, unanticipated or new hazards, or other condition changes, then all work pertaining to that work component will stop until a new project specific safety plan is completed.

PSSP Minimum Worker Training Requirements		
Topic	**Who Needs Training**	**What Training is Needed**
Project Specific Safety Plan	All project management, supervision, and workers entering the project	Safety rules and procedures contained in the Safety & Health Management Program (SHMP), site-specific emergency action plan, each worker's responsibilities, disciplinary program, and warm up and stretching exercises.
Hazard Communication	All workers entering the project	Hazard Communication Basic Training (Refer to Hazard Communication Program in this SHMP)
Hazardous Chemical or Substance	Workers exposed to a hazardous chemical or substance	Specific Hazard Communication Training (Refer to Hazard Communication Program in this SHMP)
Respiratory Protection	Workers required to wear respiratory protection, including common dust masks.	OSHA 29 CFR 1910.134 or 1926.103
Fall Protection	Any worker who might be exposed to a fall hazard	The nature of fall hazards; Procedures for erecting, disassembling, maintaining and inspecting fall protection

PSSP Minimum Worker Training Requirements		
		systems; Use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, controlled access zones and other fall protection; Procedures for handling equipment and erection of overhead protection; Fall protection standards; Rescue plan.
PPE	Workers using PPE	Refer to article on PPE or regulatory standards.
Forklifts	Operators of powered industrial trucks	Types or trucks operated; Hazards of the workplace; Hands-on performance evaluation.
Confined Spaces	Any worker attending to, supervising, entering or working within a confined space	Hazards of the space; Duties of entrants, attendants, supervisors; Air monitoring
Permit-Required Confined Space	Any worker attending to, supervising, entering or working within a permit-required confined space	Hazards of the space; Duties of entrants, attendants, supervisors; measures used to eliminate or control hazards; Air monitoring requirements; Emergency procedures/rescue equipment; Communications; Permitting procedures; PPE
Excavations/Trenches	Workers entering or working within an excavation/trench	Hazards of the space (slides, cave-ins, water accumulation, etc.); Safe means of access/egress; Proper support system procedures (erection, maintenance, disassembly and inspection)
Lock/Tagout	Workers affected by hazardous energy sources	Nature of known hazardous energy sources; Project-specific Lockout/Tagout procedures

PSSP Minimum Worker Training Requirements		
Gas Welding & Cutting	Workers conducting gas welding and/or cutting	The safe use of fuel gas
Arc Welding & Cutting	Workers conducting arc welding and/or cutting	What to do with unattended machines and electrode holders; Operations around water; Shielding arc welding
Hot Work	Workers conducting hot work activities	Hazards of the area; Permits; Duties of Fire Watch; How to use a fire extinguisher
Scaffolding	Workers working from scaffolding	The nature of any known hazards; Proper erection, maintenance, and disassembly of fall protection systems; Falling object protection; Material/equipment handling from scaffold; Maximum load-carrying capacity; Scaffold tagging system; Access and egress
Crane Baskets	Workers working from crane baskets	Safe work rules; 100% fall protection; Lift plans content; Emergency procedures
Silica	Workers potentially exposed to Respirable crystalline silica	Hazards of Respirable crystalline silica; Understanding Table 1; If needed, respiratory protection program

6. Crew Daily Pre-Task Safety & Hazard Analysis Planning (DHA)
    a. A Daily Pre-Task Safety & Hazard Analysis Plan will be completed daily by each crew performing work on this project. The CMa will provide a template if requested by the contractors.
    b. Each foreman/first-line supervisor will analyze task(s) to be performed by their crew and identify the work sequences, hazards, training, controls and emergency action plans necessary to protect workers from the identified hazards.
    c. The work will be broken down into individual steps (i.e., all the steps the work crew will have to take in order to complete that task); the known hazards associated with the work; and the hazard controls (tools, safety equipment, safety rules, safe work practices, etc.). This is a time for workers to provide input into the pre-task plan.
    d. Foreman/first-line supervisors will review the plan with their respective work crew so that each worker is aware of what work activities will occur during the shift, what hazards to be aware of and how to properly control or eliminate those hazards. Each worker will sign the plan stating that they understand the work activities, hazards and controls. This is also an acknowledgement that each worker agrees to work according to the plan.
    e. The completed pre-task plan shall be posted in a conspicuous location near the work activity.

f. Those tasks with similar work can use prior pre-task plans, but the plan must still be dated and reviewed with crew members at the beginning of the shift. If the scope of work changes or a new hazard appears during the work, the first-line supervisor will stop their crew members and revise the pre-task plan.
g. End of shift sign-off: Each worker is required to sign off at the end of shift confirming that any injuries were reported.

7. No work will be performed on any energized electrical circuit, buss-bars, equipment, or panels unless an approved written work plan is developed in accordance with Chapter 1 of NFPA 70E and submitted to the CMa for review prior to performance of the work.
8. Electrical equipment and tools used on this project shall be inspected by a competent person to prevent any worker from receiving an accidental electrical shock. This rule will apply to all cord sertts, portable electrical equipment, tools and appliances no part of any permanent building or structural electrical systems.
9. All temporary cord sets will be three wire, 16 gauge or heavier, with a hard or extra hard duty rating.
10. Electrical Cord Management
    a. All cord sets will be elevated above work surface when practical.
    b. Wire, nails, or other conductive material will not be used to hang or attach cord sets or welding leads.
    c. Cord sets that cross roadways will be protected from damage by vehicle and equipment traffic by devices such as hose bridges.
11. General Electrical Requirements
    a. Light stringers and halogen lamps will have the lamps protected from accidental contact or breakage and will be hung per manufacturers specifications.
    b. UL approved covers are required on all panels, load centers, pull boxes, and similar items prior to energizing. Necessary steps will be taken to prevent unauthorized or unqualified workers access to energized electrical parts or equipment.
12. Additional Fall Protection Requirements
    a. Prime Contractors, sub-tier contractors, agents, vendors, and suppliers or other third party individuals will take all practical measures to eliminate, prevent, and control fall hazards. All work will be planned with the intent to eliminate identified fall hazards. When a fall hazard has been identified and cannot be eliminated, then effective means of fall protection will be implemented. Acceptable fall protection systems include the following:
        1) Guardrail systems
        2) Safety netting
        3) Covers for floor, roof and wall openings. Covers must be clearly marked as "HOLE"
        4) Positioning device systems
        5) Protection from falling objects
        6) Personal fall arrest system
    b. Retractable lifelines shall be utilized with personal fall arrest systems; lanyards will not be acceptable.
    c. 100% Fall Protection Required. All employees will be 100 percent protected while working six feet or higher off the ground or when hazards below six feet dictate enforcement at a lesser height. This policy will apply to all contractors, even when OSHA allows for exceptions. In the event where local statutes require fall protection at less then six feet the more stringent standard will apply.

d. Workers engaged in steel erection activities , including but not limited to connecting, decking, and bolt up, are not exempt from the 100 percent fall protection requirements when working from heights of six feet or greater.

13. Fire Prevention and Protection
    a. Prime contractor shall develop and provide a Fire Protection Plan in accordance with OSHA 29 CFR 1926 Subpart F.
    b. All activities that require welding, cutting or an open flame is present require a minimum of 2-hour fire watch. Provide continuous fire watch, including off hours, for temporary heating using open flame units.
    c. Any temporary structures or protection shall be construction of non-combustible materials or have a fire resistance rating of one (1) hour.
    d. Hot work is defined as the use of open flames, or other heat sources, and/or spark producing devices in areas where combustible or flammable materials are present and/or where there is potential for explosion or fire. Hot work activities include burning, welding, cutting, grinding, or other operations that produce a flame, heat, or sparks.
        1) Prior to performing "Hot Work" operations, workers shall notify the CMa in accordance with requirements set forth in the contract documents. The CMa will coordinate with the Owner's activities and provide written confirmation before any hot work can commence.
14. Flammable Liquid Storage & Dispensing
    a. Storage of flammable liquids are to be stored in fireproof containers as required by OSHA.
    b. No flammable, combustible, or explosive gasses or liquids are permitted to be stored in open areas without protective roof covering including but limited to roofs and open site areas.
    c. Gas powered generators shall be located outside the structures a minimum of 10 feet from the edge of the structure or other flammable materials.
15. Prime Contractor Safety Personnel
    a. Each Prime Contractor shall designate an experienced and fully trained member of the Contractor's organization at the Project Site whose duty shall include the prevention of accidents and the enforcement of the project safety requirements relating to the Contractors Scope of Work. Any incident or accident, no matter how minor, must be reported to the CMa immediately. All incidents will be documented in the web based project software service.
        1) Contractors shall coordinate, through the CMa, and conduct weekly on site safety inspections. Prime Contractors shall designate a safety representative, with focus on the contractor's safety duties and responsibilities. Contractors shall submit a formal report of their findings, within one day, and advise Montgomery County for corrective actions to address any issues identified during the walk through.
    b. Contractors that have thirty (30) or more workers (including sub-tier contractors) will provide a full-time onsite safety professional upon mobilization. This person will have no other responsibilities.
    c. Contractors that have less then thirty (30) workers on -site (including sub-tier contractors) will designate a safety representative prior to mobilization. This on-site safety representative will be a competent worker who has completed at least thirty (30) hours of OSHA awareness training and how may have other onsite duties. This worker must ne onsite at all times to serve in this capacity.
    d. Contractors will submit the resume of their proposed safety professional or representative to be reviewed by the CMa. The CMa will determine if the proposed safety professional or representative has the training and experience required for this project. This person will have the

authority and responsibility to ensure the proper implementation of safety requirements stipulated within their PSSP and project requirements.

e. Contractor's safety professional and representative will have the full authority to implement safety corrections and recommendations. Sub-tier contractors safety professionals and representatives will have the authority to stop any work they deem unsafe.

f. When Prime Contractors crew sizes are larger than thirty (30) workers, inclusive of sub-tier contractors, the contractor shall employ a full-time-on-site safety professional. This individual shall be dedicated to safety oversight and not have a dual role. The safety professional shall have the following minimum qualifications:

1) Five years construction experience, one year of which includes on-site construction safety responsibilities.
2) Specialized training relevant to the Scope of Work being performed.
3) OSHA 30-hour construction safety awareness course.
4) Working knowledge of safety regulations and hazard control methods.
5) Demonstrate ability to conduct safety training.
6) The minimum duties of the designated safety professional are as follows:
   a) Investigate any incident or near miss and report the findings to the CMa.
   b) Attend safety meetings as required by the CMa.
   c) Conduct regular safety meetings with the workers to instruct them on project safety practices and requirements.
   d) Conduct written daily safety inspections of their work activities and make available to CMa for review to ensure compliance with safe work practices. and this Safety & health Management Program.

16. Safety Meetings
    a. Safety personnel are required to attend all meetings stipulated in the "Lean Procedures" including but not limited to Last Planner and Daily Huddles.
    b. The CMa will conduct safety meetings monthly. These meetings will last one (1) hour and review all aspects of safety onsite. Each Prime Contractor safety personnel and key sub-tier contractors shall attend.
17. Silica- If there is a potential for silica exposure, the contractor shall submit a Silica Control Plan. If the contractor opts not to follow Table 1 from OSHA 1926.1153 Respirable Crystalline Silica standard, historical data must be provided.
18. Radios, headphones, and other music devices are prohibited. Any contractor employee using these devices will be removed from the project.

Z. Existing Adjacent Structures and Site

1. Damages
   a. All Contractors are cautioned that, because this Work will be performed within an occupied, operational training campus, all precautions, protection and care must be exercised to protect existing structures and site elements in accordance with good safety practices. This is particularly applicable to protection of site occupants, trainees, instructors, emergency response professionals and all equipment and vehicles. The Contractor is responsible for any damage, which may occur to the property of the Owner or any occupant on site which in any way results from the acts or neglect of the Contractors sub-tier contractors, employees, agents, vendors, or suppliers. In addition to repairing the damage at the expense of the Contractor, all damages thereto including damage to existing utilities and paving arising from operations under the

Contract. Repair and protection is the Contractors responsibility regardless of the assignment of responsibility for inspection, testing or similar service.

AA. Finished Work Protection

1. All Contractors are wholly responsible for the protection of finished work, both their own and that of others, as may be required to perform their own work. Each Contractor is responsible for any damage which may occur to the property of any other Contractor connected with the work or to adjacent private or public properties, or to any portion of the structure that in any way results from the acts or or neglect of his/her employees.
2. Contractors will avoid excessive loading on elevated decks and roofs. Remove debris without letting it accumulate on floors. If contractor intends to utilize equipment on elevated decks for the transportation/conveyance of materials or workers or for supporting, lifting or other activity in which the structure is not intended to support, the contractor will be required to hire a structural engineer to evaluate the live and dead load imposed by the equipment and confirm it's use is not detrimental to the structure.

BB. Contractor Acknowledgements

1. Contractor acknowledges and agrees that it has taken into account all items necessary to complete the Work of each contract. The Work shall be provided in accordance with the Contract Documents and shall include, but shall not be limited to, all labor, supervision, materials, supports, engineering, tools, equipment, access to work, hoisting, rigging, transportation, permits, taxes, insurance, fees, warranties and guarantees required to perform, comply with, and complete the Work as shown, described, and intended within this Summary and the Contract Documents. Contractor shall include all items necessary and implied but not necessarily detailed or described within the the Contract Documents or as may be required by local codes and authorities having jurisdiction for complete and working systems and assemblies. No adjustment to contract time and/or contract sum shall be allowed or accepted for any errors or omissions on the part of the Contractor or its contractors, agents, employees, vendors or suppliers.
2. Contractor acknowledges that they have visited the Project site and are familiar with all work conditions. Contractor has reviewed existing conditions in the field and is familiar with security requirements, traffic regulations, and other restrictions affecting access to and performance of the Work.

1.5 CONTRACT NO. GC-01 - GENERAL CONSTRUCTION

A. The Work of the General Construction Contract Package: GC-01 includes, but is not limited to, the Work detailed or described within all procurement and contracting documents, by the specification section within the following specification Divisions, Work shown, implied and/or indicated on the drawings and as described in the contract description. The Work is not restricted by the division of drawings or specifications. Unless otherwise specifically noted, all Work will be performed in accordance with the Contract Documents and applicable codes and governing jurisdictions.

1. This work shall include all labor, supervision, material, tools, equipment, shop drawings, submittals, layout, unloading, scaffolding, ladders, hoisting, transportation, permits, engineering, support functions, insurance, bonds, and any other items or services necessary for and reasonably incidental to the proper execution and completion of the work, whether temporary or permanent, in accordance with all drawings, specifications, addenda, general conditions, project requirements, and other related documents as indicated herein and/or within the project contract and/or procurement documents.

B. It is the responsibility of each contractor to review and understand all the Contract Documents provided whether specifically indicated to be within their Contract Package or not. **All Contract Documents including but not limited to the Drawings, Specifications, and supplemental information are part of this contract.** Every Contract Document contains critical information for the coordination and completion of the Work of the Project. Where specifications, drawings, or other information provided contain conflicting information, the provisions, terms, and conditions of the more stringent shall take precedence.

C. The following list of specification divisions and drawings are not intended to be an all inclusive outline of requirements for this Contract Package but serve as a general reference. See GENERAL SCOPE OF WORK; APPLICABLE TO ALL CONTRACTORS for additional references.

1. **Specifications:**
   a. All specification sections within the Project Manual/Specification Book(s) within the following Divisions (See 00 0010 - Table of Contents for sections within each Division):
      1) Division 03 -- Concrete
      2) Division 04 -- Masonry
      3) Division 05 -- Metals
      4) Division 06 -- Wood, Plastics, and Composites
      5) Division 07 -- Thermal and Moisture Protection
      6) Division 08 -- Openings
      7) Division 09 -- Finishes
      8) Division 10 -- Specialties
      9) Division 11 -- Equipment
      10) Division 13 -- Special Construction
      11) Division 26 -- Electrical
      12) Division 31 -- Earthwork
      13) Division 32 -- Exterior Improvements
      14) Division 33 -- Utilities
      15) Division 40 -- Process Integration
2. **Drawings**
   a. All drawings under the headings/categories GENERAL/CODE, CIVIL - NEW WORK, ARCHITECTURAL - NEW WORK, STRUCTURAL - GENERAL, STRUCTURAL - NEW WORK, MECHANICAL - GENERAL, MECHANICAL - NEW WORK, ELECTRICAL - GENERAL, and ELECTRICAL - NEW WORK indicated within the DRAWING INDEX located on Sheet G000 "COVER SHEET" of the separately bound drawing set titled Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township dated May 21, 2026, as modified by subsequent Addenda and Contract Modifications.

D. GC-01 General Construction Prime Contractor is responsible for providing all Work of the Project as indicated within and intended by the Contract Documents not specifically included within the PC-22 Plumbing Construction contract package and the EC-26 Electrical Construction contract package. The Work of the GC-01 General Construction contract package generally consists of the following:

1. All Site/Civil Work of the Project excluding the provision or installation of domestic water supply and facility gas supply (vapor and liquid) and electric power supply, site lighting, and data/fiber optic service systems within utility trenches.
2. Construction of Training Tower Building 1 (B1), Residential Training Structure Building 2 (B2), and Recovery Pavilion Building 3 (B3) excluding the provision or installation of domestic water supply, fire protection water supply, and facility gas supply (vapor and liquid) and electric power supply, interior

lighting, exterior lighting, site lighting, data/fiber optic service, and lightning protection systems unless otherwise noted.

3. Live Fire Training Simulation equipment, controls, and accessories unless otherwise noted.
4. Training Props and Mock Plumbing and Electrical Meters, Cabinets, Panels and Valves unless noted otherwise.

E. Site/Civil Work generally consists of the following:

1. Project Layout and Stakeout
   a. GC-01 Contactor is responsible to provide initial vertical control (at minimum of two locations on site) . Contractor is responsible to provide all additional layout/stakeout as required to perform their Work beyond the initial vertical control.
2. Site Demolition
   a. GC-01 Contractor is responsible for the demolition and disposal of existing construction indicated within the Contract Documents.
3. Site Utility Trenching for plumbing and electrical utilities extending beyond the footprint of any building, structure or existing equipment pad.
   a. GC-01 General Construction Prime Contractor will provide all Site Utility Trenching to depths and widths required for the installation of the utilities to be placed within the trench.
      1) All Contractors will coordinate trenching requirements for site utilities including but not limited to domestic water supply and facility gas supply (vapor and liquid) and electric power supply, site lighting, and data/fiber optic service systems.
   b. PC-22 and EC-26 Contractors, respectively, will be responsible for the preparation of the utility trench provided by the GC-01 General Construction Prime Contractor, for the installation of the site utilities included within their contract package.
   c. The PC-22 and EC-26 Contractors, respectively, will be responsible for backfilling utility trenches and preparing sub-grade of backfilled trench for surfacing materials and/or assemblies provided by the GC-01 Contractor.
   d. GC-01 Contractor will be responsible for providing surfacing materials and/or assemblies at all site utility trenching as indicated within and intended by the Contract Documents. Surfacing materials and assemblies will consist of, but are not limited to, asphalt paving assemblies, concrete paving assemblies, topsoil and seeding or sod, and topsoil landscaping and ground covering.
4. Earthwork
   a. GC-01 Contractor is responsible for all Earthwork activities including but not limited to existing utility location, erosion and sediment pollution control, clearing and grubbing, rough-grading, building pad preparation, and final grading.
      1) In addition to the PA one call, perform Ground Penetrating Radar (GPR) and soft digging to locate existing utilities prior to performing any excavation. Contractor will temporarily support and protect utilities that are encountered during excavation. Additional materials are to be available on site to immediately repair any utilities damaged while performing this work. Immediately notify the CMa of unforeseen underground utilities or conditions encountered.
   b. GC-01 Contractor will be responsible for testing of soils for contaminants and hazardous materials. Where contaminants and/or hazardous materials are found within soils that preclude their use as suitable fill, Contractor will be responsible for the legal off-site disposal of such soils. Payment for the handling and offsite disposal of contaminated soils shall be by unit price allowance procedures.
5. Site Paving

a. GC-01 Contractor is responsible for the provision, furnishing, and installation of asphalt paving assemblies, concrete paving assemblies, concrete equipment pads, sidewalks, concrete aprons, asphalt patching/repair, curbing, and paint striping.

6. Stormwater Management
   a. GC-01 Contractor is responsible for the provision, furnishing, and installation of all stormwater management elements including, but not limited to, stormwater facilities, structures, manholes, drains, piping, inlets, spillways, plantings, filters, and infiltration basins.
7. Landscaping
   a. GC-01 Contractor is responsible for the provision, furnishing, and installation of all landscaping elements including, but not limited to, top soil, seeding, sod, ground covering, and plantings.
8. Miscellaneous Site Elements and Furnishings
   a. GC-01 Contractor is responsible for the provision, furnishing, and installation of all miscellaneous site elements and furnishings including, but not limited to, chain link fencing and gates, bollards, and concrete car bumpers.

F. Construction of Training Tower Building 1 (B1), Residential Training Structure Building 2 (B2), and Recovery Pavilion Building 3 (B3) as indicated within and intended by the Contract Documents generally consisting of, but not limited to, the provision, furnishing, and installation of building pad/site preparation, foundations/footings, structural steel components and assemblies, wall and partition assemblies, floor assemblies, ceiling assemblies, roof assemblies, pre-engineered metal buildings/structures, miscellaneous metal fabrications, stairs, catwalks, doors, training/fire doors, training/fire shutters, windows, louvers, scuppers, miscellaneous openings, thermal lining systems, fire brick protective floor and base assemblies, ladders, railings and gates, safety and rappelling tie-offs and accessories, signage and dimensional lettering, visual display boards, and miscellaneous furnishings.

G. Live Fire Training System, Training Props, and Mock Plumbing and Electrical Equipment
1. Live Fire Training System
   a. GC-01 Contractor is responsible for the provision, furnishing, and installation of the live training system of the Project as indicated within and intended by the Contract Documents including, but not limited to, the following:
      1) Class A live fire props and pans.
      2) Class B Live fire training burn simulators and control equipment.
      3) Exhaust fans and control equipment.
      4) Smoke generation systems
      5) Audio systems
      6) Temperature and gas supply sensors and monitoring equipment.
      7) Low voltage (data/fiber optic service) conduit for control cabling/conductors and data cabling for live fire training equipment and systems.
         a) GC-01 Contractor will provide data/fiber optic service conduit from pull box/junction box/distribution box to live fire training equipment located within the associated control room and direct connections from live fire training equipment to live fire training equipment within each control room.
         b) EC-26 Contractor shall provide data/fiber optic service conduit from pull box/junction box/distribution box within the control room to all live fire training equipment located outside of the associated control room.

(1) GC-01 Contractor shall coordinate with Prime Contractor providing low voltage (data/fiber optic service) conduit for concealed installation within wall and floor assemblies.

b. Low voltage (electric power supply) conduit and cabling/conductors for live fire training equipment and systems.
   1) EC-26 Contractor will provide electric power supply conduit and cabling/conductors and final connections for live fire training equipment.
   2) GC-01 Contractor shall coordinate with Prime Contractor providing low voltage (electric power supply) conduit for concealed installation within wall and floor assemblies.

2. Training Props
   a. GC-01 Contractor is responsible for the provision, furnishing, and installation of various training props of the Project as indicated within and intended by the Contract Documents including, but not limited to, the following:
      1) Pallet Style Burn Crib(s)
      2) Forcible Entry Door(s) and accessories
      3) Ceiling Pull Prop(s)
      4) Roof Chop Out Panel Prop(s)
   b. GC-01 will coordinate with the PC-22 Contractor for training props provided under the PC-22 contract package. Training Props include, but may not be limited to, the following
      1) Sprinkler Prop, Standpipes and Fire Department Connections.
         a) See "Fire Protection Water Supply System" article above.
3. Mock Plumbing and Electrical Equipment
   a. GC-01 Contractor is responsible for the provision, furnishing, and installation of all mock plumbing and electrical equipment of the Project as indicated within and intended by the Contract Documents including, but not limited to, the following:
      1) Mock Valve Cabinet
      2) Mock Gas Meter
      3) Commercial Electric Meter Prop
      4) Residential Meter Prop
      5) Electrical Disconnect Prop
      6) Electrical Commercial Disconnect Prop

H. Project Administration
1. Contractor shall be responsible for performing all project administration tasks as required by the Contract Documents and as indicated within this specification Section. Review and coordinate administration scope of work with all other contract packages.

I. Temporary Facilities and Controls
1. General
   a. GC-01 Contractor shall provide all temporary facilities required to complete the scope of work of this contract package that are not specifically provided for under another contract package scope.
2. Field Offices
   a. GC-01 Contractor will provide field offices for their own use as they deem necessary to complete the Work of their contract package and as complies with the provisions of the Site Staging and Logistics Plan.

b. GC-01 Contractor shall provide a common use job site trailer for use by the Owner, Architect, CMa and other Contractors for the purpose of various job meetings, Contractor As-built coordination/maintenance, and other required activities.
c. GC-01 Contractor shall provide an Administration Office job site trailer for use by the Owner and CMa.

3. Signage
   a. Contractor shall provide project identification sign, directional signage, safety signage, and other general project signage for the control of pedestrians and workers.
4. Temporary Water Supply
   a. Contractor will provide temporary water supply as required by the Contract Documents for use by all contractors.
   b. Contractor shall be responsible for maintaining water supply throughout the duration of construction or until its removal is approved by the CMa, Architect, or Owner.
      1) Temporary water tank(s) may be filled utilizing the Owner's existing water system. Owner shall designate hose bib to be utilized by construction personnel for tank filling only. Contractor providing water tank shall be responsible for transportation of water tank to hose bib location every time tank is to be filled and returning tank to location indicated with the Site Staging and Logistics Plan.
5. Telecommunication Services
   a. GC-01 Contractor will provide wireless telecommunication service with wireless routers located within the common use and CMa 's field office(s).
6. Sanitary Facilities
   a. The GC-01 Contractor will provide sufficient sanitary facilities for the use of personnel of all contractors on project site. Contractor shall maintain these facilities in a clean and sanitary condition. Contractor shall be responsible for monitoring and scheduling change over, cleaning and pumping of facilities on a regular basis. The Owner reserves the right to require additional toilet facilities if quantity is deemed insufficient by them. Additional toilet facilities shall be provided at no additional cost to the contract.
      1) Facilities shall be located per the Site Staging and Logistics Plan.
      2) Provide soap and disposable towels at hand wash stations.
      3) Sanitary facilities shall be cleaned and sanitized a minimum of two times per week.
7. Construction Cleaning
   a. GC-01 Contractor will provide and maintain dumpsters and/or recycling containers within the training grounds for use by all contractors. Location of dumpsters and recycling containers shall be coordinated with the Site Staging and Logistics Plan.
      1) Contractor must provide sufficient waste containers to meet the project schedule and to avoid delay to other contractors and phases of work. Contractor shall promptly remove and replace waste containers as required to maintain the schedule and work flow.
      2) Contractor will be responsible for monitoring, scheduling, administering, and recording container pulls from site. Empty containers must be available upon removal of existing, full containers so as not to impact the construction activities. Any double handling of waste or delay in construction activities due to container removal/placement will be the responsibility of this contractor.
   b. If Contractor opts to install a trash chute, the chute and installation must be engineered, and follow all requirements by the regulating agencies. Provide dust containment and dust suppression as needed to comply with requirements of the AHJ and Owner.

8. Snow Removal
    a. Provide snow removal within contract limits at the conclusion of a weather event to avoid schedule delays. Remove standing water and snow from structure decks and roofs immediately following a rain event or due to snow melt.
9. Miscellaneous Temporary Facilities
    a. Provide and maintain temporary weather protection, temporary roofing, temporary enclosures, temporary heat, cooling, dehumidification, and ventilation required for product installation as required and recommended by the product manufacturer and these specifications and as required to maintain the project schedule and avoid delays.
10. Utility Fees
        1) Contractor will be responsible to pay fees associated with connection, installation, inspection, testing, and final acceptance of utilities included within the Scope of Work of the GC-01 contract package.

J. House Keeping Pads and Curbs
1. GC-01 General Construction Prime Contractor shall provide housekeeping pads and concrete curbs shown on the drawings.
    a. Housekeeping pads and curbs not shown on drawings but required for the installation of equipment shall be provided by the Prime Contractor required to provide the equipment.

K. Embeds, Blocking, Equipment Anchors, and other Metal Fabrication Supports
1. GC-01 Contractor shall be responsible for installing all miscellaneous items embedded within masonry and concrete wall, floor, ceiling, and roof assemblies required to support his Work and the work of other Prime Contractors. Miscellaneous embeds may include, but are not limited to, sleeves, hangers, rods, strut channel metal framing, and other supporting or transfer accessories.
    a. PC-22 and EC-26 Contractors are required to provide to the GC-01Contractor all embeds required to be installed within the work of the GC-01 contract package.
    b. PC-22 and EC-26 Contractors are required to provide to the GC-01Contractor coordination drawings indicating locations of all embeds required to be installed within the work of the GC-01 contract package.

L. Carpentry
1. Contractor shall provide all carpentry work as required to complete the work of this Contract Package including but not limited to the following:
    a. Miscellaneous Rough Carpentry
    b. In wall wood blocking.
    c. All wood shall be fire/weather treated to comply with applicable codes and AHJ.

M. Access Panels
1. GC-01 Contractor will be responsible for installing all access panels within wall and ceiling assemblies required to access Work of other Prime Contract Packages.PC-22 Contractor shall furnish to the GC-01 General Construction Prime Contractor all access doors/panels required for the completion of this work. Contractor shall provide coordination drawings to the GC-01 contractor indicating placement of all access doors/panels. GC-01 contractor shall be responsible for installing all access doors/panels.
    a. PC-22 and EC-26 Contractor shall furnish to the GC-01 Contractor all access doors/panels required to be installed within the work of the GC-01 contract package.

b. PC-22 and EC-26 Contractor are required to provide to the GC-01 Contractor coordination drawings indicating locations of all access panels required to be installed within the work of the GC-01 contract package.

N. Core Drilling, Cutting and Patching
1. Contractor shall be responsible for core drilling, cutting and patching as required to perform work or their contract package. Include restoration of surfaces to original condition. Cutting to be performed in manner to minimize patching.

O. Maintenance of Equipment
1. For equipment provided under this Contact Package, provide interim maintenance of the equipment during construction, start-up, temporary usage, and commissioning periods until acceptance by Owner. Provide extended warranties for equipment used, started, and operated prior to Owner acceptance. Maintenance records shall be kept during this period and turned over to the CMa upon request. The warranty period stipulated within the Contract Documents begins on the date of Substantial Completion of the Project.

P. Project Record (As-Built) Drawings:
1. Contractor shall provide a redlined updated PDF set of drawings of all improvements installed by this Contract as required by the Contract Documents; See Section 01 7800 - Closeout Submittals. Redline updated information shall include, but not be limited to, denoting active and abandoned utilities encountered, and modifications to original design documents denoting actual installations, differing materials, and actual locations of provided construction items.
2. Civil/Site As-Builts: Provide As-Built CAD file(s) of the Civil Drawings at the completion of all improvements installed by all Prime Contract Packages indicting final construction conditions. This includes denoting active and abandoned utilities encountered. As-Builts related to utility and site improvements shall be completed by a licensed surveyor and all deviations from the design documents clearly identified. This contractor shall incorporate as-built information provided by all other Prime Contractors for all items outside of the footprint of each building.

Q. Final Cleaning
1. Provide all final cleaning labor, materials, and equipment. Final cleaning will be provided at a standard that is acceptable for the Owner's occupancy. Submit cleaning products and materials satisfactory to manufacturer's standards. Provide final cleaning for interior and exterior areas and finishes including but not limited to the following:

1.6 CONTRACT NO. PC-22 - PLUMBING CONSTRUCTION

A. The Work of the Plumbing Construction Contract Package: PC-22 includes, but is not limited to, the Work detailed or described within all procurement and contracting documents, by the following specification sections, shown, implied and/or indicated on the drawings and as described in the contract description. The Work is not restricted by the division of drawings or specifications. Unless otherwise specifically noted, all Work will be performed in accordance with the Contract Documents and applicable codes and governing jurisdictions.
1. This work shall include all labor, supervision, material, tools, equipment, shop drawings, submittals, layout, unloading, scaffolding, ladders, hoisting, transportation, permits, engineering, support functions, insurance, bonds, and any other items or services necessary for and reasonably incidental to the proper execution and completion of the work, whether temporary or permanent, in accordance

with all drawings, specifications, addenda, general conditions, project requirements, and other related documents as indicated herein and/or within the project contract and/or procurement documents.

B. It is the responsibility of each contractor to review and understand all the Contract Documents provided whether specifically indicated to be within their Contract Package or not. **All Contract Documents including but not limited to the Drawings, Specifications, and supplemental information are part of this contract.** Every Contract Document contains critical information for the coordination and completion of the Work of the Project. Where specifications, drawings, or other information provided contain conflicting information, the provisions, terms, and conditions of the more stringent shall take precedence.

C. The following list of specification divisions and drawings are not intended to be an all inclusive outline of requirements for this Contract Package but serve as a general reference. See GENERAL SCOPE OF WORK; APPLICABLE TO ALL CONTRACTORS for additional references.

1. **Specifications**
    a. All specification sections within the Project Manual/Specification Book(s) within the following Divisions (See 00 0010 - Table of Contents for sections within each Division):
        1) Division 03 -- Concrete
        2) Division 05 -- Metals
        3) Division 06 -- Wood, Plastics, and Composites
        4) Division 07 -- Thermal and Moisture Protection
        5) Division 11 -- Equipment
        6) Division 13 -- Special Construction
        7) Division 21 -- Fire Suppression
        8) Division 22 -- Plumbing
        9) Division 23 - Heating Ventilating Air-Conditioning (HVAC)
        10) Division 31 -- Earthwork
        11) Division 32 -- Exterior Improvements
        12) Division 33 -- Utilities
2. **Drawings**
    a. All drawings under the headings/categories CIVIL - GENERAL, CIVIL - NEW WORK, MECHANICAL - GENERAL, and MECHANICAL - NEW WORK indicated within the DRAWING INDEX located on Sheet G000 "COVER SHEET" of the separately bound drawing set titled Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township dated May 21, 2026, as modified by subsequent Addenda and Contract Modifications.

D. Contractor is responsible for the provision, furnishing, installation, modification, and relocation of all plumbing utilities and systems of the Project including, but not limited to, domestic water supply, fire protection water supply, and facility gas supply (vapor and liquid) systems.

1. Domestic Water Supply System
    a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational domestic water supply system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
    b. Domestic water supply system generally includes, but is not limited to, the extension of the Owner's existing domestic water supply system from the existing main administration/classroom building across the existing site to the proposed Recovery Pavilion (Building 3; B3), installation

of system components within and through Building 3; B3, and final connection of fixtures and equipment.

2. Fire Protection Water Supply System
   a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational fire protection water supply system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
   b. Fire protection water supply system generally includes, but is not limited to, the installation of training standpipes, training sprinkler system, and fire department connections within the Training Tower Building 1; B1 and Residential Training Structure Building 2; B2.
3. Facility Gas Supply System
   a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational facility gas supply system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
      1) Facility gas supply system generally includes, but is not limited to, the relocation and/or removal and installation of existing and/or new gas storage tanks; connection of gas supply from the storage tanks to the Training Tower Building 1; B1, Residential Training Structure Building 2; B2, and on site training props/pad utility connection points; and extension of gas supply within Building 1 and Building 2 to locations of live fire training equipment and controls.
      2) Contractor will coordinate propane tank provision or relocation with Owner's propane provider.
         a) Propane Provider: Suburban Propane, 3115 State Rd., Telford, PA 18969; Phone: 215-257-0131.
      3) GC-01 General Construction Prime Contractor shall provide live fire training equipment and will make final connection of gas supply to live fire training equipment. PC-22 Plumbing Construction Prime Contractor will provide gas supply system rough-in with shut-off capable to receive final connection components of the live fire training equipment.
      4) PC-22 Plumbing Construction Prime Contractor will coordinate all requirements of live fire training system with System provider.
   b. Coordinate routing, sizing, and rough-in installation of gas supply system components with equipment and construction provided by other Prime Contracts.
      1) Route system piping tight to supporting walls and ceilings. Minimize piping runs within training rooms to the greatest extent possible; run piping within control rooms, equipment closets and non-training areas to the greatest extent possible. Exposed components of facility gas supply system with the exception of shut-offs, equipment connections and similar operating components shall be protected with continuous bent metal protection plates. Routing of piping shall be approved by Architect prior to installation.
      2) Rough-in locations and equipment connection locations may vary based upon the plumb/level installation of equipment placed on sloping floors and cricket locations and heights.
      3) Rough-in locations and equipment connection locations may vary in areas receiving fire brick flooring.

E. Training Props and Mock Plumbing Equipment

1. PC-22 Contractor is responsible for the provision, furnishing, and installation of various training props of the Project including, but not limited to, the following
   a. Sprinkler Prop, Standpipes and Fire Department Connections.
      1) See "Fire Protection Water Supply System" article above.
2. GC-01 General Construction Prime Contractor is responsible for providing the following mock plumbing equipment:
   a. Mock Gas Meter
   b. Mock Valve Cabinet

F. Project Administration
1. Contractor shall be responsible for performing all project administration tasks as required by the Contract Documents and as indicated within this specification Section. Review and coordinate administration scope of work with all other contract packages.

G. Utility Fees
1. Contractor will be responsible to pay fees associated with connection, installation, inspection, testing, and final acceptance of utilities included within the Scope of Work of the PC-22 contract package.

H. Site Utilities Trenching
1. Contractor will coordinate trenching requirements for site utilities including but not limited to domestic water supply and facility gas supply (vapor and liquid) systems.
2. GC-01 General Construction Prime Contractor will provide Site Utility Trenching to depths and widths required for the installation of the utilities to be placed within the trench.
3. PC-22 Contractor will be responsible for the preparation of the utility trench provided by the GC-01 General Construction Prime Contractor, for the installation of the site utilities included within this contract package.
   a. Contractor shall provide and install within the trench all utility components required by the Contract Documents including but not limited to subgrade materials, bedding materials, supporting materials, drainage stone, backfill, concrete work (thrust blocks, collars, bases), piping, fittings, valves, backflow preventers, hand holes, vaults, metallic location tape and other accessories and required items of the system.
   b. Contractor shall be responsible for backfilling and compacting trenches as required by the Contract Documents up to subgrade elevation. Prepare backfill subgrade for repair/installation of surfacing materials and assemblies. Compaction of backfill is required to be tested and verified by third party testing and inspection agency. Where backfill does not meet project requirements, Contractor will be responsible for repair, remediation, replacement, and re-inspection until backfill meets project requirements.

I. House Keeping Pads and Curbs
1. GC-01 General Construction Prime Contractor shall provide housekeeping pads and concrete curbs shown on the drawings.
2. Contractor will review all drawings for concrete pad and curb locations. Coordinate with the GC-01 General Construction Prime Contractor for the final size of house keeping pads as required for equipment and clearances being provided and installed within this Contract Package. Housekeeping pads and curbs not shown on drawings but required for the installation of equipment of this Contract Package shall be provided by this Prime Contractor.

J. Embeds, Blocking, Equipment Anchors, and other Metal Fabrication Supports

1. Contractor shall provide all miscellaneous metal items to support his work including but not limited to all hangers, rods, strut channel metal framing, and accessories including, but not limited to, seismic accessories. This Contractor shall supply the GC-01 General Construction Prime Contractor all items to be embedded within CMU and Cast-in-place concrete that are required to support their work.

K. Carpentry
1. Contractor shall provide all carpentry work as required to complete the work of this Contract Package including but not limited to the following:
   a. Miscellaneous Rough Carpentry
   b. In wall wood blocking.
   c. All wood shall be fire/weather treated to comply with applicable codes and AHJ.

L. Access Panels
1. PC-22 Contractor shall furnish to the GC-01 General Construction Prime Contractor all access doors/panels required for the completion of this work. Contractor shall provide coordination drawings to the GC-01 contractor indicating placement of all access doors/panels. GC-01 contractor shall be responsible for installing all access doors/panels.
2. PC-22 Contractor shall coordinate access panels with building finishes and assemblies for proper type of panel/installation. Coordination drawings shall be required to be approved by the CMa and Architect prior to installation of ANY portions of systems. Placement of valves and other accessible work shall be placed such that access doors/panels shall be set in an inconspicuous location.

M. Core Drilling, Cutting and Patching
1. Contractor shall be responsible for core drilling, cutting and patching as required to perform work or their contract package. Include restoration of surfaces to original condition. Cutting to be performed in manner to minimize patching.

N. Maintenance of Equipment
1. For plumbing equipment provided under this Contact Package, provide interim maintenance of the equipment during construction, start-up, temporary usage, and commissioning periods until acceptance by Owner. Provide extended warranties for equipment used, started, and operated prior to Owner acceptance. Maintenance records shall be kept during this period and turned over to the CMa upon request. The warranty period stipulated within the Contract Documents begins on the date of Substantial Completion of the Project.

1.7 CONTRACT NO. EC-26 - ELECTRICAL CONSTRUCTION

A. The Work of the Electrical Construction Contract Package: EC-26 includes, but is not limited to, the Work detailed or described within all procurement and contracting documents, by the following specification sections, shown, implied and/or indicated on the drawings and as described in the contract description. The Work is not restricted by the division of drawings or specifications. Unless otherwise specifically noted, all Work will be performed in accordance with the Contract Documents and applicable codes and governing jurisdictions.
1. This work shall include all labor, supervision, material, tools, equipment, shop drawings, submittals, layout, unloading, scaffolding, ladders, hoisting, transportation, permits, engineering, support functions, insurance, bonds, and any other items or services necessary for and reasonably incidental to the proper execution and completion of the work, whether temporary or permanent, in accordance

with all drawings, specifications, addenda, general conditions, project requirements, and other related documents as indicated herein and/or within the project contract and/or procurement documents.

B. It is the responsibility of the EC-26 contractor to review and understand all the Contract Documents provided whether specifically indicated to be within their Contract Package or not. **All Contract Documents including but not limited to the Drawings, Specifications, and supplemental information are part of this contract.** Every Contract Document contains critical information for the coordination and completion of the Work of the Project. Where specifications, drawings, or other information provided contain conflicting information, the provisions, terms, and conditions of the more stringent shall take precedence.

C. The following list of specification divisions, sections and drawings are not intended to be an all inclusive outline of requirements for this Contract Package but serve as a general reference. See GENERAL SCOPE OF WORK; APPLICABLE TO ALL CONTRACTORS for additional references.

1. **Specification Sections**
    a. All specification sections within the Project Manual/Specification Book(s) within the following Divisions (See 00 0010 - Table of Contents for sections within each Division):
        1) Division 03 -- Concrete
        2) Division 05 -- Metals
        3) Division 06 -- Wood, Plastics, and Composites
        4) Division 07 -- Thermal and Moisture Protection
        5) Division 11 -- Equipment
        6) Division 13 -- Special Construction
        7) Division 26 -- Electrical
        8) Division 31 -- Earthwork
        9) Division 32 -- Exterior Improvements
        10) Division 33 -- Utilities
2. **Drawings**
    a. All drawings under the headings/categories CIVIL - GENERAL, CIVIL - NEW WORK, ELECTRICAL - GENERAL, and ELECTRICAL - NEW WORK indicated within the DRAWING INDEX located on Sheet G000 "COVER SHEET" of the separately bound drawing set titled Montgomery County New Live Fire Training Building Public Safety Training Center, Plymouth Township dated May 21, 2026, as modified by subsequent Addenda and Contract Modifications.

D. EC-26 Contractor is responsible for the provision, furnishing, installation, modification, and relocation of all electrical utilities and systems of the Project including, but not limited to, electric power supply, interior lighting, exterior lighting, site lighting, data/fiber optic service, and lightning protection systems.

1. Electric Power Supply System
    a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational electric power supply system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
    b. Electric power supply system generally includes, but is not limited to, the following:
        1) Extension of the Owner's existing electrical power supply system from the existing onsite exterior mounted electrical gear across the site to new exterior mounted electrical gear, Training Tower; Building 1 (B1), Residential Training Structure; Building 2 (B2), Recovery

Pavilion; Building 3 (B3), site lighting, training utility connection locations, site located equipment and other locations indicated within the Contract Documents.

a) Coordinate utility trenching requirements with GC-01 General Construction Prime Contractor. Coordination items include, but are not limited to, trench routing, width, depth, sequencing, and overall schedule of trench work.

2) Installation of power supply system within Building 1 (B1), Building 2 (B2), Building 3 (B3), and final connection of fixtures and equipment unless otherwise indicated. System shall include but not be limited to coordination drawings, conduit, fittings, boxes, devices, cable/conductors, fuses, disconnects, panels, electrical gear, devices, and other components and accessories.

3) GC-01 General Construction Prime Contractor shall provide live fire training equipment. EC-26 Electrical Construction Prime Contractor will provide electrical power supply system rough-in and final connection to live fire training equipment.

2. Interior Lighting
   a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational interior lighting system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
   b. Interior lighting system generally includes, but is not limited to, the installation of conduit, boxes, power cabling/conductors, control cabling/conductors, control devices and systems, fixtures, and lamps.
3. Exterior Lighting
   a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational interior lighting and exterior lighting system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
   b. Exterior lighting system generally includes, but is not limited to, the installation of conduit, boxes, power cabling/conductors, control cabling/conductors, control devices and systems, fixtures, and lamps.
4. Site Lighting
   a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational site lighting system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
   b. Site lighting system generally includes, but is not limited to, pole lights and flood lights and the following:
      1) Extension of electric power system and control system from locations indicated within Contract Documents across site to each site light location within utility trench provided within the GC-01 General Construction contract package.
      2) Final connection of electric power system to fixture and grounding of electric power system.
      3) Installation of poles, brackets, bases and other supporting elements.
      4) Installation of conduit, manholes, pullboxes, junction and device boxes, power cabling/conductors, control cabling/conductors, control devices and systems, grounding system, site poles and associated mounting accessories, fixtures, lamps, associated power devices and receptacles, concrete pole bases, and reinforcing of concrete pole bases.
5. Data/Fiber Optic Service

a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational data/fiber optic service system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
b. Data/fiber optic service system generally includes, but is not limited to, the following
    1) Site Installation of Data/Fiber Optic Service:
        a) Extension of data/fiber optic cabling conduit and pull string from Owner's existing main classroom building to designated control room within Training Tower Building 1 (B1); from designated control room of Building 1 to designated control room in Residential Training Structure Building 2 (B2); and from Owner's existing main classroom building to designated entry location within Recovery Pavilion Building 3 (B3). Extension of data/fiber optic cabling conduit and pull string shall be installed within utility trench provided within the GC-01 General Construction contract package.
            (1) Routing shall be as indicated within the Contract Documents. Provide pull boxes and handholes as indicated and required.
    2) Building/Structure Installation of Data/Fiber Optic Service
        a) Extension of data/fiber optic cabling conduit and pull string within each building and/or structure connecting all live fire training system components including, but not limited to, gas monitoring equipment, gas sensors, temperature monitoring equipment/sensors, emergency stop stations, smoke generation equipment, flame control panels, wireless controllers, and exhaust fans.
            (1) Provide within each control room of both the Training Tower Building 1 (B1) and Residential Training Structure Building (B2) pull box/junction box/distribution box in which all data/fiber optic service conduit shall be connected to and distributed from with the exception of equipment indicated to be directly connected.
            (2) EC-26 Contractor shall provide data/fiber optic service conduit from pull box/junction box/distribution box to all live fire training equipment located outside of the associated control room.
            (3) GC-01 General Construction contractor will provide data/fiber optic service conduit from pull box/junction box/distribution box to live fire training equipment located within the associated control room and direct connections from live fire training equipment to live fire training equipment within each control room.
            (4) Contractor shall coordinate conduit installation with requirements of live fire training equipment provided as part of the GC-01 General Construction contract package.

6. Lightning Protection
    a. Contractor shall be responsible for providing all Work associated with and as required to provide a complete and functional/operational lightning protection system as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
    b. Lightning protection system will be a delegated design system and will generally include, but is not limited to, air terminals, lightning protection rated conductors, equipotential bonding connections, down conductors, and grounding system.
        1) System shall be provided at the Training Tower Building 1 (B1) and Residential Training Structure Building 2 (B2).
7. Conduit and Cabling Installation

a. All conduit shall be metal unless installed below grade. Below grade conduit shall be PVC.
b. Coordinate routing, sizing, and rough-in installation of electrical system components with equipment and construction provided by other Prime Contracts.
   1) Rough-in locations and equipment connection locations may vary based upon the plumb/level installation of equipment placed on sloping floors and cricket locations and heights.
   2) Rough-in locations and equipment connection locations may vary in areas receiving fire brick flooring.
c. Training Tower Building 1; (B1) and Residential Training Structure Building 2; (B2) Conduit and Cabling
   1) All conduit and cabling shall be coordinated with and installed within masonry walls, concrete walls, elevated concrete slabs or below slabs on grade. Exposed conduit shall be acceptable within non-training equipment and control rooms only. Installation and routing of domestic water supply, fire protection water supply, and facility gas supply (vapor and liquid) systems shall be given priority over electric power supply and data/fiber optic service systems. Coordinate locations of plumbing systems prior to installation of electrical systems.
   2) Back boxes and mounting boxes shall be installed recessed within walls, floors, and ceilings unless otherwise noted.
d. Recovery Pavilion Building 3 (B3) Conduit and Cabling
   1) All conduit and cabling shall be coordinated with and installed within wall cavities, attic spaces, soffit spaces, and other concealed spaces unless otherwise impossible.

E. Training Props and Mock Electrical Equipment
1. EC-26 Contractor is responsible for the provision, furnishing, and installation of various training props of the Project including, but not limited to, the following
   a. Simulation/Mock Power Pole Prop(s)
      1) Contractor shall be responsible for providing all Work associated with and as required to provide complete and functional/operational simulation/Mock Power Pole Props as indicated within and intended by the Contract Documents. This shall include all Work of accepted Alternates, and approved Allowances.
2. GC-01 General Construction Prime Contractor is responsible for providing the following mock electrical equipment:
   a. Mock Electrical Meter
   b. Mock Electrical Panel

F. Project Administration
1. Contractor shall be responsible for performing all project administration tasks as required by the Contract Documents and as indicated within this specification Section. Review and coordinate administration scope of work with all other contract packages.

G. Temporary Facilities and Controls
1. Contractor will provide temporary electrical power supply as required by the Contract Documents for use by all contractors.
2. Contractor will provide temporary electrical power connection to field office of this contract package, Common Use Field Office, CMaField Office, PC-22 Prime Contractor Field Office, and GC-01 Field Office. Coordinate locations of field offices with Site Staging and Logistics Plan.

H. Utility Fees
1. Contractor will be responsible to pay fees associated with connection, installation, inspection, testing, and final acceptance of utilities included within the Scope of Work of the EC-26 contract package.

I. Site Utilities Trenching
1. Contractor will coordinate trenching requirements for site utilities including but not limited to electric power supply, site lighting, and data/fiber optic service systems.
2. GC-01 General Construction Prime Contractor will provide Site Utility Trenching to depths and widths required for the installation of the utilities to be placed within the trench.
3. EC-26 Contractor will be responsible for the preparation of the utility trench provided by the GC-01 General Construction Prime Contractor, for the installation of the site utilities included within this contract package.
    a. Contractor shall provide and install within the trench all utility components required by the Contract Documents including but not limited to subgrade materials, bedding materials, supporting materials, drainage stone, backfill, concrete work (duct banks), conduit, fittings, pull boxes, hand holes, vaults, metallic location tape and other accessories and required items of the system.
    b. Contractor shall be responsible for backfilling and compacting trenches as required by the Contract Documents up to subgrade elevation. Prepare backfill subgrade for repair/installation of surfacing materials and assemblies. Compaction of backfill is required to be tested and verified by third party testing and inspection agency. Where backfill does not meet project requirements, Contractor will be responsible for repair, remediation, replacement, and re-inspection until backfill meets project requirements.

J. House Keeping Pads and Curbs
1. GC-01 General Construction Prime Contractor shall provide housekeeping pads and concrete curbs shown on the drawings.
2. Contractor will review all drawings for concrete pad and curb locations. Coordinate with the GC-01 General Construction Prime Contractor for the final size of house keeping pads as required for equipment and clearances being provided and installed within this Contract Package. Housekeeping pads and curbs not shown on drawings but required for the installation of equipment of this Contract Package shall be provided by this Prime Contractor.

K. Embeds, Blocking, Equipment Anchors, and other Metal Fabrication Supports
1. Contractor shall provide all miscellaneous metal items to support his work including but not limited to all hangers, rods, strut channel metal framing, and accessories including, but not limited to, seismic accessories. This Contractor shall supply the GC-01 General Construction Prime Contractor all items to be embedded within CMU and Cast-in-place concrete that are required to support their work.

L. Carpentry
1. Contractor shall provide all carpentry work as required to complete the work of this Contract Package including but not limited to the following:
    a. Miscellaneous Rough Carpentry
    b. In wall wood blocking.
    c. All wood shall be fire/weather treated to comply with applicable codes and AHJ.

M. Access Panels

1. EC-26 Contractor shall furnish to the GC-01 General Construction Prime Contractor all access doors/panels required for the completion of this work. Contractor shall provide coordination drawings to the GC-01 contractor indicating placement of all access doors/panels. GC-01 contractor shall be responsible for installing all access doors/panels.
2. EC-26 Contractor shall coordinate access panels with building finishes and assemblies for proper type of panel/installation. Coordination drawings shall be required to be approved by the CMa and Architect prior to installation of ANY portions of systems. Placement of pull boxes, distribution boxes, shut-offs, disconnects and other accessible work shall be placed such that access doors/panels shall be set in an inconspicuous location.

N. Core Drilling, Cutting and Patching
1. Contractor shall be responsible for core drilling, cutting and patching as required to perform work or their contract package. Include restoration of surfaces to original condition. Cutting to be performed in manner to minimize patching.

O. Maintenance of Equipment
1. For electrical equipment provided under this Contact Package, provide interim maintenance of the equipment during construction, start-up, temporary usage, and commissioning periods until acceptance by Owner. Provide extended warranties for equipment used, started, and operated prior to Owner acceptance. Maintenance records shall be kept during this period and turned over to the CMa upon request. The warranty period stipulated within the Contract Documents begins on the date of Substantial Completion of the Project.

P. Switch over of the temporary service to the permanent service shall ba at a time so as not to affect the on-going construction activities. There will not be any adjustment to the Contract Sum or Contract Time where switch over of service needs to occur during premium or overtime shifts.

Q. Complete cleaning of all electrical panels, meters, gear, transformers and other electrical equipment prior to final acceptance.

END OF SECTION 01 1010

SECTION 01 2000 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Payment procedures relating to allowances.

B. Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

C. Section 01 7800 - Closeout Submittals: Project record documents.

1.3 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, unless otherwise stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values to the CMa in duplicate within 10 business days after date of Owner-Contractor Agreement.

E. Format: Utilize the Table of Contents of this Project Manual to establish line items for the schedule of values. Provide at least one line for each Specification Section. Identify each line item with number and title of the specification section. Owner reserves the right to require line items of the schedule of values be broken down further as may be required to satisfy the Owner.
   1. Coordinate line items required to be indicated as separate activities or line items by individual Specification Sections of this Project Manual or Contractor's Construction Schedule.
   2. 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 onsite and items stored off-site. When required by Owner, include evidence of insurance.

3. Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub-schedules within the Schedule of Values showing values coordinated with each separate element of Work.
4. Arrange schedule of values to include the following General Conditions/General Requirements breakdowns:
    a. General Conditions
        1) Supervision
            a) Project Manager(s)
            b) Field Supervision
            c) Project Engineer/Administration
            d) Safety
        2) Bonds
        3) Taxes & Insurance
        4) Permitting
        5) Clean Up
            a) Throughout project - Labor
            b) Final Cleaning
        6) Schedule Management
            a) Baseline Development
            b) Monthly Update process
            c) Submittal Schedule/Log
        7) Temporary Facilities
            a) Temporary Utilities
            b) Temporary Lighting
            c) Fencing & Barricades
            d) Temporary Sanitary Facilities
            e) Other Temporary Facilities and Controls Identified within the Contract Documents
        8) QC/QA
            a) Commissioning
            b) Testing and Inspections
        9) Closeout
            a) As-Builts
            b) Punchlist
            c) Closeout Documentation

F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

G. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

H. Revise Schedule of Values to list approved Change Orders, with each Application For Payment.

I. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's construction schedule and other administrative forms and schedules including but not limited to the following:
    1. Application for Payment forms with continuation sheets.

2. Submittal Schedule

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement. Where not stipulated within the Agreement, the period covered by each Application for Payment shall be one month beginning on the first day of the month and ending on the last day of the month.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. For each item, provide a column for listing each of the following:
1. Item Number.
2. Description of work.
3. Scheduled Values.
4. Work in Place and Sored Materials of Previous Applications.
5. Work in Place and Stored Materials under this Application.
6. Authorized Change Orders.
7. Total Completed and Stored to Date of Application.
8. Percentage of Completion.
9. Balance to Finish.
10. Retainage.

F. Execute certification by signature of individual authorized to sign legal documents on behalf of the Contractor and notarize.

G. Use data from approved updated Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
1. Amount indicated within Application for Payment for stored materials shall not include overhead and profit.

H. Stored Materials: Include the following information with each Application for Payment where amounts are applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; DO NOT include overhead and profit on stored materials.

I. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

J. Submit one electronic and three hard-copies of each Application for Payment.

K. Include the following with the Initial Application for Payment: The Initial Application for Payment will not be approved until all items below are provided.
1. Transmittal letter as specified for submittals in Section 01 3000.
2. List of Subcontractors Owning more than 5% of the Contract Sum.
3. Schedule of Values.
4. Contractor's construction scheduled.
5. Submittal schedule.
6. Certificates of Insurance and Insurance Policies.
7. Performance and Payment Bonds
8. Information required from Contractor for the acquisition of Owner's insurance.

L. Each Application for Payment following the Initial Application for Payment shall be consistent with the previous Applications for Payment as certified by the CMa and Owner/Architect and paid for by the Owner. Include the following with each subsequent Application for Payment:
1. Transmittal letter as specified for submittals in Section 01 3000.
2. Construction progress schedule, revised and current as specified in Section 01 3000.
3. Current construction photographs specified in Section 01 3000.
4. Partial release of liens from major subcontractors and vendors.
5. Project record documents as specified in Section 01 7800, for review by Owner which will be returned to the Contractor.
6. Affidavits attesting to off-site stored products.

M. When CMaand/or Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions though CMato Contractor in the form and an ASI or Architects Supplemental Instruction.

C. For other changes involving an adjustment to the Contract Sum or Contract Time, with the exception of a Construction Change Directive, whether initiated by CMa, Owner/Architect or by Contractor, the Contractor shall be required to submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
1. A request for a change proposal by the CMa, Owner/Architect are not instructions to either stop work in progress or to execute the proposed/requested change.

D. Construction Change Directive: For other required changes, CMawill issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. The Contractor must promptly execute the change.

E. CMa, Owner/Architect Initiated Proposal Requests: For changes in which advanced pricing is desired, CMa will issue a document that includes a detailed description of a proposed change which may include

supplementary or revised drawings and specifications. Contractor shall prepare and submit a fixed price quotation within 14 calendar days.

F. Contractor Initiated Proposal Requests: Contractor may propose a change by submitting a request for change to CMa, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

G. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by CMa, Owner or Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by CMa.
3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
4. For change ordered by CMa without a quotation from Contractor, Construction Change Directive, the amount will be determined by CMa based on the Contractor's substantiation of costs as specified for Time and Material work.

H. Substantiation of Costs: Provide full information required for evaluation and directly attributable to the change.
1. Provide the following data:
    a. Quantities of products, labor, and equipment.
    b. Taxes, insurance, and bonds.
    c. Delivery charges, equipment rental, and amount of trade discounts.
    d. Overhead and profit.
    e. Justification for any change in Contract Time.
    f. Credit for deletions from Contract, similarly documented.
2. Support each claim for additional costs with additional information:
    a. Origin and date of claim.
    b. Dates and times work was performed, and by whom.
    c. Time records and wage rates paid.
    d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

I. Execution of Change Orders: Upon Owners approval of a Change Order, the CMa will issue AIA Document G701 for signatures of parties as provided in the Conditions of the Contract.

J. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

K. After execution of Change Order, promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

L. Promptly enter changes in Project Record Documents.

1.6 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.
   2. Evidence of completion of Project closeout requirements.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. Fully executed AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   5. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2000

SECTION 01 2100 - ALLOWANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contingency allowance.

B. Payment and modification procedures relating to allowances.

1.2 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from a Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.4 ALLOWANCES SCHEDULE

A. Allowance No. GC-01 . 1: Site Work and Unforeseen Conditions Contingency Allowance: Include the sum indicated within the Bid Form; To be used at the discretion of the Owner for unforseen conditions and site remediation requirements. This allowance shall be included within the GC-01 Construction Package.

B. Allowance No. GC-01 . 2: Waterline Work Contingency Allowance: Include the sum indicated within the Bid Form; To be used at the discretion of the Owner for Waterline Work. This allowance shall be included within the GC-01 Construction Package.

C. Allowance No. GC-01 . 3: Recover Pavilion Contingency Allowance: Include the sum indicated within the Bid Form within Alternate No. 1 Recovery Pavilion Alternate Bid Item cost; To be used at the discretion of the Owner for unforseen conditions and general construction requirements. This allowance shall be included within the GC-01 Construction Package within Alternate No. 1 Recovery Pavilion Alternate Bid Item scope of work.

D. Allowance No. PC-22 . 1: Owner General Construction Contingency Allowance: Include the sum indicated within the Bid Form; To be used at the discretion of the Owner for unforseen conditions and general construction requirements. This allowance shall be included within the PC-22 Construction Package.

E. Allowance No. EC-26 . 1:Owner General Construction Contingency Allowance: Include the sum indicated within the Bid Form; To be used at the discretion of the Owner for unforseen conditions and general construction requirements. This allowance shall be included within the EC-26 Construction Package.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2100

SECTION 01 2200 - UNIT PRICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.2 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.4 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements, record, and compute quantities. All recorded measurements and quantity calculations shall be provided to CMa, Owner and Architect for review and approval.

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 measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. Measurement Devices:
1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
3. Metering Devices: Inspected, tested and certified by the applicable state department within the past year.

E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

G. Measurement by Area: Measured by square dimension using mean length and width or radius.

H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

I. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

J. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

K. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes , calculate and certify quantities for payment purposes.

1.5 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the CMa, Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.6 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct one of the following remedies:
1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect.
2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

1.7 SCHEDULE OF UNIT PRICES

A. General Unit Prices: Will be included within each contract package.
1. Unit Price No. 1: Placement of Engineered Fill

a. Description: Upon completion of unsatisfactory soil removal, prepare and compact surface to comply with Project requirements and provide and install, in 8 inch lifts maximum, Engineered Fill with maximum aggregate size of 1.5 inches and not more than 2% passing #200 sieve.
b. Unit of Measure: One cubic yard (CY) of Engineered Fill placed per Project requirements. Quantity based on professional surveyor of volume placed.
1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of non-compacted fill will not be acceptable.

2. Unit Price No. 2: Placement of Drainage Stone Fill; #2A Stone:
a. Description: Upon completion of unsatisfactory soil removal, prepare and compact surface to comply with Project requirements and provide and install #2A Drainage Stone Fill per Project requirements.
b. Unit of Measure: One cubic yard (CY) of Drainage Stone Fill placed per Project requirements. Quantity based on professional surveyor of volume placed.
1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of non-compacted fill will not be acceptable.

3. Unit Price No. 3: Placement of Drainage Stone Fill; #8 AASHTO Stone:
a. Description: Upon completion of unsatisfactory soil removal, prepare and compact surface to comply with Project requirements and provide and install #2A Drainage Stone Fill per Project requirements.
b. Unit of Measure: One cubic yard (CY) of Drainage Stone Fill placed per Project requirements. Quantity based on professional surveyor of volume placed.
1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of non-compacted fill will not be acceptable.

4. Unit Price No. 4: Placement of Drainage Stone Fill; #2B Stone (#57 AASHTO):
a. Description: Upon completion of unsatisfactory soil removal, prepare and compact surface to comply with Project requirements and provide and install #2B (#57 AASHTO) Drainage Stone Fill per Project requirements.
b. Unit of Measure: One cubic yard (CY) of Drainage Stone Fill placed per Project requirements. Quantity based on professional surveyor of volume placed.
1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of non-compacted fill will not be acceptable.

B. GC-01 Construction Package Unit Prices
1. Unit Price No. 5: Removal and Disposal of Contaminated Soil
a. Description: Soil excavation, testing of excavation materials for presence of HAZMAT, and appropriate off-site disposal of contaminated materials in an EPA certified/licensed facility. Contractor shall be responsible for transporting, carrying, packaging, and disposal of materials as required by the EPA and other Authorities Having Jurisdiction over the handling, transporting, and disposal of contaminated materials. Maintain records of transportation, handling and disposal as required by Authority Having Jurisdiction; provide all records to Owner. Landfill option for the legal disposal of contaminated excavation materials includes but is not limited to Republic Services New Morgan Landfill located in Morgantown Pennsylvania. The Contractor is not required to utilize the landfill option indicated and may utilize any landfill certified/licensed to receive contaminated material for disposal as approved by the EPA and other Authorities Having Jurisdiction.
b. Unit of Measure: One cubic yard (CY) of soil excavated, based upon professional surveyor of volume removed.

1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of expanded spoils will not be acceptable.

2. Unit Price No. 6: Removal of Unsatisfactory Soil
   a. Description: Excavation and off-site disposal of soil not meeting the requirements of the Project.
   b. Unit of Measure: One cubic yard (CY) of soil excavated, based on professional surveyor of volume removed.
      1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of expanded spoils will not be acceptable.
3. Unit Price No. 7: Removal of Rock
   a. Description: Excavation and off-site disposal of classified rock.
   b. Unit of Measure: One cubic yard (CY) of rock excavated, based on professional surveyor of volume removed.
      1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of expanded spoils will not be acceptable.
4. Unit Price No. 8: Removal of Rock, Utility Trench
   a. Description: Excavation, off-site disposal, and compaction of any rock encountered in utility trench excavation which cannot be removed by rock excavation equipment and procedures indicated.
   b. Unit of Measure: One cubic yard (CY) of trench rock excavated, based on professional surveyor of volume removed.
      1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of expanded spoils will not be acceptable.
5. Unit Price No. 9: Site Utility Trenching
   a. Description: Excavation of utility trench per requirements (location, width, depth, and slope) of site utility provider/installer and off-site disposal of trench spoils as required by Contract Documents.
   b. Unit of Measure: One cubic yard (CY) of trench excavated, based on professional surveyor of volume removed.
      1) Measurement or quantification of soil by truck load, bucket load, or similar quantity count, or by volume of expanded spoils will not be acceptable.
6. Unit Price No. 10: Milling and Placement of Asphalt Top Layer for Patching of Existing Asphalt:
   a. Description: Remove 1-1/2 inches of existing asphalt wear layer and install of new asphalt wear layer per "ASPHALT PAVEMENT RESTORATION" detail over continuous tack coat. Wear layer shall be Superpave Asphalt Mixture Design. Wearing Course PG 64S-22, 9.5 mm Mix, 1-1/2 inches Compacted Depth per Project requirements. All paving materials shall be in accordance with the latest PA DOT Form 408 Manual, unless otherwise noted.
   b. Unit of Measure: One square foot (SF) of pavement area.
7. Unit Price No. 11: Full Depth Replacement of Existing Asphalt Paving:
   a. Description: Remove existing asphalt paving down to subgrade and install of new asphalt paving per "ASPHALT PAVEMENT RESTORATION" detail.
   b. Unit of Measure: One square foot (SF) of pavement area.
8. Unit Price No. 12: Placement of Concrete Sidewalk:
   a. Description: Site preparation and placement of concrete sidewalk. Strip, clear and grub, and excavate down to subgrade. Compact virgin soil and test per requirements. Place and compact drainage stone subbase, reinforcement and concrete per requirements of Contract Documents; "CONCRETE SIDEWALK" detail.
   b. Unit of Measure: One square feet (SF) of sidewalk.

9. Unit Price No. 13: Replacement of Existing Concrete Paving:
    a. Description: Demolition and off site disposal of existing concrete paving down to stone subbase. Saw cut full depth of existing concrete slab on grade. Break-up concrete and remove concrete to expose existing stone subbase. Place additional drainage stone to match existing stone subbase in type and height/depth and install new concrete paving section. Place new concrete paving section per requirements of the Contract Documents; "CONCRETE PAVEMENT RESTORATION DETAIL".
    b. Unit of Measure: One square feet (SF) of concrete paving.
10. Unit Price No. 14: Placement of Concrete Paving:
    a. Description: Site preparation and placement of concrete paving. Strip, clear and grub, and excavate down to subgrade. Compact virgin soil and test per requirements. Place and compact drainage stone subbase, reinforcement and concrete paving per requirements of Contract Documents; "CONCRETE PAVING" detail.
    b. Unit of Measure: One square feet (SF) of concrete paving.

C. PC-22 Construction Package Unit Prices
1. Unit Price No. 15: Installation of Site Underground Gas Piping: 2 inch:
    a. Description: Coordinate utility trench requirements with GC-01 General Contractor. Prepare site utility trench provided separately from this Unit Price for the installation of gas system piping, including but not limited to bedding, drainage fill, structural fill or other piping support. Provide and install gas piping, fittings, couplings, and other accesssories of gas system piping. Backfill site utility trench to subgrade for surfacing materials and assemblies. Perform compaction and testing as required by the Contract Documents for the surfacing materials and/or assemblies.
    b. Unit of Measure: One linear foot (LF) of gas piping.
2. Unit Price No. 16: Installation of Building Underground Gas Piping: 2 inch:
    a. Description: Excavate utility trench under building slab on grade, prepare under slab trench for the installation of gas system piping, including but not limited to bedding, drainage fill, structural fill or other piping support. Provide and install 2 inch gas piping, fittings, couplings, and other accesssories of gas system piping. Backfill trench to subgrade for installation of building slab on grade as required by the Contract Documents.
    b. Unit of Measure: One linear foot (LF) of gas piping.
3. Unit Price No. 17: Installation of Above Ground Gas Piping: 2 inch:
    a. Description: Provide and install 2 inch gas piping, fittings, couplings, hangers, supports and other accesssories of gas system piping.
    b. Unit of Measure: One linear foot (LF) of gas piping.
4. Unit Price No. 18: Installation of Above Ground Fire Protection Piping: 3/4 inch:
    a. Description: Provide and install 3/4 inch fire protection system piping, fittings, couplings, hangers, supports and other accesssories of fire protection system piping.
    b. Unit of Measure: One linear foot (LF) of fire protection system piping.
5. Unit Price No. 19: Installation of Above Ground Fire Protection Piping: 1 inch:
    a. Description: Provide and install 1 inch fire protection system piping, fittings, couplings, hangers, supports and other accesssories of fire protection system piping.
    b. Unit of Measure: One linear foot (LF) of fire protection system piping.
6. Unit Price No. 20: Installation of Above Ground Fire Protection Piping: 4 inch:
    a. Description: Provide and install 4 inch fire protection system piping, fittings, couplings, hangers, supports and other accesssories of fire protection system piping.
    b. Unit of Measure: One linear foot (LF) of fire piping.

7. Unit Price No. 21: Installation of Above Ground Fire Protection Piping: 6 inch:
    a. Description: Provide and install 6 inch fire protection system piping, fittings, couplings, hangers, supports and other accesssories of fire protection system piping.
    b. Unit of Measure: One linear foot (LF) of fire protection system piping.
8. Unit Price No. 22: Installation of Fire Protection System Sprinkler Head:
    a. Description: Provide and install a single sprinkler head, fittings, couplings, transitions, up to 12 inches of fire protection system piping, hangers, supports and other accesssories of fire protection system.
    b. Unit of Measure: One Sprinkler Head; Each (EA).
9. Unit Price No. 23: Installation of Site Underground Domestic Water Supply System, Cold Water Piping: 1 inch:
    a. Description: Coordinate utility trench requirements with GC-01 General Contractor. Prepare site utility trench provided separately from this Unit Price for the installation of domestic water supply system, cold water piping, including but not limited to bedding, drainage fill, structural fill or other piping support. Provide and install 1 inch domestic water supply system, cold water piping, fittings, couplings, and other accesssories of system piping. Backfill site utility trench to subgrade for surfacing materials and assemblies. Perform compaction and testing as required by the Contract Documents for the surfacing materials and/or assemblies.
    b. Unit of Measure: One linear foot (LF) of domestic water supply system, cold water piping.
10. Unit Price No. 24: Installation of Building Underground Domestic Water Supply System, Cold Water Piping: 1 inch:
    a. Description: Excavate utility trench under building slab on grade, prepare under slab trench for the installation of domestic water supply system, cold water piping, including but not limited to bedding, drainage fill, structural fill or other piping support. Provide and install 1 inch domestic water supply system, cold water piping, fittings, couplings, and other accesssories of system piping. Backfill trench to subgrade for installation of building slab on grade as required by the Contract Documents.
    b. Unit of Measure: One linear foot (LF) of domestic water supply system, cold water piping.

D. EC-26 Construction Package Unit Prices
1. Unit Price No. 25: Installation of Site Underground Electrical System Conduit: 4 inch:
    a. Description: Coordinate utility trench requirements with GC-01 General Contractor. Prepare site utility trench provided separately from this Unit Price for the installation of electrical system conduit, including but not limited to bedding, drainage fill, structural fill or other piping support. Provide and install 4 inch electrical system conduit, fittings, couplings, and other accesssories of conduit system. Backfill site utility trench to subgrade for surfacing materials and assemblies. Perform compaction and testing as required by the Contract Documents for the surfacing materials and/or assemblies.
    b. Unit of Measure: One linear foot (LF) of electrical system conduit.
2. Unit Price No. 26: Installation of Building Underground Electrical System Conduit: 4 inch:
    a. Description: Excavate utility trench under building slab on grade, prepare under slab trench for the installation of electrical system conduit, including but not limited to bedding, drainage fill, structural fill or other conduit support. Provide and install 4 inch electrical system conduit, fittings, couplings, and other accesssories of conduit system. Backfill trench to subgrade for installation of building slab on grade as required by the Contract Documents.
    b. Unit of Measure: One linear foot (LF) of electrical system conduit.
3. Unit Price No. 27: Installation of Site Underground Electrical System Conduit: 2-1/2 inch:

a. Description: Coordinate utility trench requirements with GC-01 General Contractor. Prepare site utility trench provided separately from this Unit Price for the installation of electrical system conduit, including but not limited to bedding, drainage fill, structural fill or other piping support. Provide and install 2-1/2 inch electrical system conduit, fittings, couplings, and other accesssories of conduit system. Backfill site utility trench to subgrade for surfacing materials and assemblies. Perform compaction and testing as required by the Contract Documents for the surfacing materials and/or assemblies.
b. Unit of Measure: One linear foot (LF) of electrical system conduit.

4. Unit Price No. 28: Installation of Building Underground Electrical System Conduit: 2-1/2 inch:
   a. Description: Excavate utility trench under building slab on grade, prepare under slab trench for the installation of electrical system conduit, including but not limited to bedding, drainage fill, structural fill or other conduit support. Provide and install 2-1/2 inch electrical system conduit, fittings, couplings, and other accesssories of conduit system. Backfill trench to subgrade for installation of building slab on grade as required by the Contract Documents.
   b. Unit of Measure: One linear foot (LF) of electrical system conduit.
5. Unit Price No. 29: Installation of Above Ground Electrical System Conduit: 3/4 inch:
   a. Description: Provide and install 3/4 inch electrical system conduit, fittings, couplings, hangers, supports and other accesssories of electrical system conduit.
   b. Unit of Measure: One linear foot (LF) of electrical system conduit.
6. Unit Price No. 30: Installation of Above Ground Electrical System Conduit: 1 inch:
   a. Description: Provide and install 1 inch electrical system conduit, fittings, couplings, hangers, supports and other accesssories of electrical system conduit.
   b. Unit of Measure: One linear foot (LF) of electrical system conduit.
7. Unit Price No. 31: Installation of Above Ground Electrical System Conduit: 1-1/2 inch:
   a. Description: Provide and install 1-1/2 inch electrical system conduit, fittings, couplings, hangers, supports and other accesssories of electrical system conduit.
   b. Unit of Measure: One linear foot (LF) of electrical system conduit.
8. Unit Price No. 32: Installation of GFI Duplex Outlet:
   a. Description: Provide and install a single GFI duplex outlet in water proof enclosure with cover that allows for in use connection, cabling/conductors, fittings, couplings, transitions, up to 12 inches of electrical system conduit, hangers, supports and other accesssories of electrical system conduit.
   b. Unit of Measure: One GFI Duplex Outlet; Each (EA).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2200

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SECTION 01 2300 - ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Sum and Contract Time.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidder(s) as stated within the bid form(s) 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 the 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 the "Schedule of Alternates" article of this Section shall only be a part of the Work if enumerated in the Agreement or subsequently made part of the Project by acceptable modification to the Agreement.
   2. The cost (addition) or credit (deduction) for each Alternate represents the net modification to the Contract Sum to incorporate the Work of the Alternate in to the Work of the Project.

1.3 PROCEDURES

A. Coordination: Revise, modify, or adjust affected adjacent Project Work only to the extent that is necessary to completely integrate the Work of the Alternate into the Project. Revisions, modifications, or adjustements shall not affect items intended to remain as part of the base Project Work.
   1. Include, as part of the Alternate, miscellaneous devices, accessories, and similar items incidental to or required for a complete installation, whether or not indicated as part of the Alternate description or drawings.

B. Execute accepted Alternates under the same conditions and requirements as other Work of the Contract.

1.4 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.5 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Recovery Pavilion:

1. Base Bid Item: Provide site utilities including underground domestic water supply system, data/fiber optic service conduit and pull string, and electric power supply conduit and pull string for Recovery Pavilion Building 3 (B3) and site lighting pole directly adjacent to Building 3 (B3) up to a point within five (5) feet of the footprint of the proposed building and to the center point of the site lighting pole base respectively. Cap utilities at or under the finished surface. Repair trenches as required and intended by the Contract Documents. The construction of the Recovery Pavilion, Building 3 (B3), and all associated systems and assemblies and other associated Work shall be excluded from the Base Bid of the Project, unless otherwise noted above. The Recovery Pavilion Contingency Allowance; Allowance No. GC-01 . 3 shall be excluded from the Base Bid of the Project.
    a. General Construction; GC-01 Contract Package
        1) Provide Trenching for Site Utilities and associated Work as indicated within and intended by the Contract Documents to depths and widths required for the installation of utilities to be placed within the trench.
        2) Recovery Pavilion Contingency Allowance; Allowance No. GC-01 . 4 shall not be included within the Base Bid Item.
    b. Plumbing Construction; PC-22 Contract Package
        1) Provide Site Utilities Trenching and associated Work as indicated within and intended by the Contract Documents for the installation of the domestic water supply system.
    c. Electrical Construction; EC-26 Contract Package
        1) Provide Site Utilities Trenching and associated Work as indicated within and intended by the Contract Documents for the installation of the data/fiber optic service system, electric power supply system and site lighting system.
2. Alternate Bid Item: Provide all Work as indicated within Contract Documents for the construction of the Recovery Pavilion, Building 3 (B3), and associated systems and assemblies.
    a. General Construction; GC-01 Contract Package
        1) Provide all labor, materials, supervision and other required Work to construct the Recovery Pavilion structure including, but not limited to, all required site work, foundations, structural framing and support elements, floor, wall, ceiling and roof assemblies, and other work indicated within the Contract Documents to be part of the General Construction Contract Package.
        2) Provide Recovery Pavilion Contingency Allowance; Allowance No. GC-01 . 3 within the Alternate Bid Item.
    b. Plumbing Construction; PC-22 Contract Package
        1) Provide all labor, material supervision and other required Work to construct the plumbing systems of the Recovery Pavilion Building 3 (B3) including, but not limited to, domestic water supplysystems within Building 3 (B3) and other Work indicated within the Contract Documents to be part of the Plumbing Contract Package.
    c. Electrical Construction; EC-26 Contract Package
        1) Provide all labor, material supervision and other required Work to construct the electrical systems of the Recovery Pavilion Building 3 (B3) including, but not limited to, electric power supply, interior lighting, exterior lighting, site lighting, and data/fiber optic service systems within Building 3 (B3), and other Work indicated within the Contract Documents to be part of the Electrical Contract Package.

B. Alternate No. 2 - Building 1 Rooftop Canopy:
    1. Base Bid Item: The construction of the Building 1 Rooftop Canopy and all associated systems and assemblies and other associated Work shall be excluded from the Base Bid of the Project.

2. Alternate Bid Item: Provide all Work as indicated within Contract Documents for the construction of the Building 1 Rooftop Canopy, and associated systems and assemblies.
   a. General Construction; GC-01 Contract Package
      1) Provide all labor, materials, supervision and other required Work to construct the Building 1 Rooftop Canopy structure including, but not limited to, all required structural framing and support elements, ceiling and roof assemblies, and other work indicated within the Contract Documents to be part of the General Construction Contract Package.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2300

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SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural and administrative requirements for proposed substitutions.

1.2 RELATED REQUIREMENTS

A. Section 00 2600 - Procurement Substitution Procedures: Administrative procedures for subsititution requests made prior to award of contract (During Procurement).

B. Section 01 2501 - Substitution Request Form: Required form for substitution requests made both prior to (During Procurement) and after (During Construction) award of contract.

C. Section 01 2200 - Unit Prices, for additional unit price requirements.

D. Section 01 2300 - Alternates, for product alternatives affecting this section.

E. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

F. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.3 DEFINITIONS

A. Substitutions: Changes from Contract Document requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability of product or material and/or required warranty terms.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.
      b. Consideration and review time by the Owner, Architect or other Owner agent or consultant of the substitution for convenience shall not be cause for delay of the Project. Substitution for Convenience requests shall be made by the Contractor with sufficient review time as to not affect the schedule or the progression of the Work. Where a response to a request for review of a substitution for convenience is not received by the Contractor from the Owner, Architect, or Owner's other agent or consultant, the Contractor shall be responsible for providing the Work required by the Contract Documents such that the Work does not delay the Project.

B. Compatibility: Compatibility of any substitution shall be cause to reject the substitution proposed by the Contractor. Compatibility shall be determined by the Architect and/or Owner at the time of the substitution

request. Products shall not be compatible if the products require the Owner to purchase or maintain attic stock, maintenance stock or replacement parts of two different products that perform the same function.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner for owners consultants and agents fees for review or redesign services associated with re-approval by all authorities having jurisdiction.
   7. Agrees to reimburse Owner for owners consultants and agents fees for design/redesign services associated with the substitution that are apparent at the time of the substitution or become apparent after the substitution has been accepted.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. It is the responsibility of the substitution proposer to provide a concise substitution request with required relevant information only. **Substitution requests including irrelevant and/or excessive information shall be rejected and returned without review.**
   2. Forms included in the Project Manual must be used for the submission of a substitution request. Where form is insufficient to provide the required information provide supplemental sheets, drawings, forms, and/or attachments indicating required information and indicate on the required form the title and location, within the substitution request packet, of additional/supplemental sheets, drawings, forms, and/or attachments.
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, CMa's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.

4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
5) Description of Substitution.
6) Reason why the specified item cannot be provided.
    a) Where reason for substitution is in whole or in part due to lead times or availability of the specified products, Contractor shall provide letter on manufacturer's letter head stating the following:
        (1) Date of purchase order request or initial contact by Contractor for specified product.
        (2) Lack of availability or extent of lead time as of the date indicated above.
        (3) Reason for delivery delay.
7) Differences between proposed substitution and specified item.
8) Description of how proposed substitution affects other parts of work.
    a) Include list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate Contractors, including design consultants, that will be necessary to accommodate proposed substitutions.

c. Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes, as appropriate and relevant for the item:
1) Physical characteristics.
2) Operational and maintenance clearances.
3) In-service performance.
4) Expected durability.
5) Visual effect.
6) Sustainable design features.
7) Warranties.
8) Compatibility with other items including, but not limited to, Owner's existing and proposed equipment, products, systems, and/or assemblies.
9) Other salient features and requirements.
10) Include, as appropriate or requested, the following types of documentation:
    a) Product Data:
    b) Samples.
    c) Certificates, test, reports or similar qualification data.
    d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:
1) Cost of Substitution: Indicate the total cost of the substitution.
2) In addition to the total cost of the substitution, provide the following:
    a) Total deduct or cost savings to the contract price or the total additional cost to the contract price.
    b) Total Substitution cost shall also be broken down to indicate the following:
        (1) Material cost.
        (2) Labor cost.
        (3) Overhead and profit or fee for each contractor.
        (4) Required engineering and/or architectural design/redesign fees including but not limited to resubmission to authorities having jursidiction for approval of permits or similar regulatory items.

3) Change of Contract Time due to accepting substitution. Indicate total deduction or addition of time to the contract including but not limited to any time for design/redesign and/or AHJ approval processes.

D. Limit each request to a single proposed substitution item.
1. Submit three hard-copies, bound and collated.
2. Submit an electronic document, combining the request form with supporting data into single document.
   a. Electronic document shall be submitted in .pdf format and shall be bookmarked to easily navigate to each major item provided within the request.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Section 00 2600 - Procurement Substitution Procedures specifies procedures and administrative requirements for substitution requests made prior to the award of contract (During Procurement).

3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
1. Submit substitution requests by completing 01 2501 - Substitution Request Form. See this section for additional information and instructions. Use only the form indicated; other forms of submission are unacceptable.

B. Submit request for a Substitution for Cause immediately upon discovery of need for substitution, but not later than 30 calendar days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Substitutions for Convenience will not be allowed unless otherwise indicated.

D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. CMa and/or Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner but not later then 7 calendar days from the date of the request for additional information.

B. CMa will notify Contractor in writing of decision to accept or reject request.

3.5 ACCEPTANCE

A. Accepted substitutions that change the work of the Project. They will be documented and incorporated into the Work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION 01 2500

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SUBSTITUTION REQUEST FORM:

Project: _____ Substitution Request No.: _____
_____ From: _____
To: _____ Date: _____
_____ Architects Project No. _____
Re: _____

Specification Title: _____ Description: _____
Section No. _____ _____
Page No. _____ Article _____

Proposed Substitution: _____
Manufacturer: _____ Website URL: _____
Trade Name: _____ Model No: _____
Installer: Phone No. _____
Differences between proposed substitution and specified product: _____

Provide point by point comparative data on separate sheet as attachment to this form. (This is required for review of any substitution.

Reason for not providing specified item: _____

Similar Installation:
Project: _____ Architect: _____
Address: _____ Owner: _____
Does proposed substitution affect other Work? [No] [Yes] (Explain) _____

Total Cost of Substitution: _____ Dollars: $ _____
Cost change to contract: [Deduct] [Addition] _____ Dollars: $ _____

Schedule Impact: [Deduct] [Addition] _____ days.
Does Substitution Require Redesign: [No] [Yes]

Submitting Representative Initials: _____

THE UNDERSIGNED CERTIFIES:

- The proposed substitution has been fully investigated by the General Contractor and determined to be equal or superior in all respects to the specified materials, products, assemblies, and/or equipment as may be applicable to the substitution request.
- General Contractor acknowledges that this proposed substitution must also meet the design intent expressed in the Contact Documents, as judged by the Architect and substantiated by the materials submitted herewith.
- General Contactor will furnish the same warranty for proposed substitution as for specified material, product, assembly, and/or equipment as may be applicable to the substitution request.
- General Contractor has verified that the same level of maintenance service and similar availability of replacement parts, as applicable, is available.
- General Contractor has verified that the proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above and further broken out on supplemental data sheets where attached is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent will be waived by the General Contractor.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made by the General Contractor for changes to building design, including A/E design, detailing, and construction costs caused by this substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be completed by the General Contractor.

Submitted By (Printed Name): _____

Signature: _____
On Behalf of (Company Name): _____
Address: _____
E-mail Address _____

Attachments:

_____
_____
_____

ARCHTIECT'S REVIEW AND ACTION

_____ Substitution Approved
_____ Substitution Approved as Noted
_____ Substitution Rejected

Architect: MW Studios, Inc.
Reviewed By: _____

Signature: _____
Date: _____

END OF SUBSTITUTION REQUEST FORM

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.

B. Web-based project management software service.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Coordination Meetings

G. Lean Training and Pull Planning Meetings

H. Last Planner Meetings

I. Lean Daily Huddles

J. Construction progress schedule.

K. Contractor's daily reports.

L. Progress photographs.

M. Coordination drawings.

N. Submittal Schedule

O. Submittals for review, information, and project closeout.

P. Number of copies of submittals.

Q. Requests for Information (RFI) procedures.

R. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Adminstrative procedures for applications for payment.

B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 01 3001 - "Submittal Review and Transmittal Form": Form for the response of submittals indicating Architect's Action and related requirements.

D. Section 01 6000 - Product Requirements: General product requirements.

E. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

F. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to CMa and Architect:
1. Requests for Information (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Action submittals.
5. Information submittals
6. Test and inspection reports.
7. Design data.
8. Delegated Designs; signed and sealed.
9. Manufacturer's instructions and field reports.
10. Applications for payment and change order requests.
11. Progress schedules.
12. Coordination drawings.
13. Correction Punch List and Final Correction Punch List for Substantial Completion.
14. Closeout submittals.
15. All other submittals as indicated within individual specification sec

C. Tracking and notification of expiring permissions, permits, and similar regulatory documentation and allowances.
1. Contractor shall be responsible for identifying the expiration dates for and deadlines/time frames for application of extensions of all regulatory permissions including but not limited to grading permits and building permits. The milestones shall be included within the Contractor's Construction/Progress Schedule.
2. Contractor shall notify the Owner and the Architect in writing of approaching deadlines for renewal/extension of regulatory permissions and expiration dates of regulatory permissions.

1.4 INFORMATION SUBMITTALS

A. Subcontractors List: Within twenty (20) calendar days of Owner-Contractor Agreement, 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. Subcontract list shall be updated weekly by Prime Contractor and submitted to the CMa. Include the following information in tabular form:
1. Name, address, and telephone 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.

B. Key Personnel Names: Within fifteen (15) calendar days of Owner-Contractor Agreement, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site or elsewhere. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office and mobile telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.5 LEAN CONSTRUCTION PRINCIPLES

A. Lean Construction Management: Montgomery County intends to implement the following Lean Construction Principles on this Project. To the extent Lean Principles are implemented, Montgomery County will require all Prime Contractors to accommodate and participate

B. "Last Planner System" (LPS) using Pull Scheduling and Percent Planned Complete (PPC) Tracking: The Project will utilize the Last Planner System to develop and implement the detailed work plans for each phase of the project based on the master project schedule. That includes Pull Plans and Percent Planned Complete (PPC) tracking that will be utilized throughout the project according to the CMa's methodology.

C. Prime Contractor Last Planner Requirements
   1. Prime Contractors shall understand that the CMa will be tracking major "promises made".
   2. All "promised" tasks shall be tracked in the matrix with a task description, Prime Contractors responsible, and promised completion date.
   3. CMa will provide Prime Contractor feedback on their reliable promising performance during weekly Foremen's meetings.
   4. CMa will provide an overall PPC rating to each Prime Contractor at the end of the project.
   5. Prime Contractors and other key personnel noted in previous sections will attend pull planning meetings at the request of CMa Superintendent/Project Manager.
   6. Actively participate in weekly work planning meetings to review past, current, and future work activities.
   7. MUST prepare and submit Weekly Work Plans as agreed by the contract.
   8. MUST report and track task completions on a weekly basis.

D. To implement the LPS effectively, it is critical for the Prime Contractors foremen to have the authority to require and implement/obligate certain specific actions on the part of the individual's firm, which are described as follows:
   1. Prime Contractor's foremen are expected to plan together with other trades in building a "Pull Schedule" for each major phase of work on the project in which they will be participating.
   2. MUST participate in Pull Planning Sessions for work that their company is involved in and have necessary authority to make decisions on manpower, equipment, materials, and other required resources to ensure commitments are met. Where non-approved attendees, late attendance, or no shows occur, the Prime Contractor will be back charged for the proper attendees time.
   3. Has the ability to plan work for their organization and authority to make commitments to the project in order to execute that plan and must be the person that is able to commit manpower and material needs.
   4. MUST know and understand the latest information about the status of contract issues, submittals and shop drawings, material and equipment deliveries, RFI's and changes in the work, safety training, labor, and construction equipment availability.

5. MUST attend and fully participate in Weekly Work Planning meetings (typically about an hour) and Daily Shift Startup Meetings (typically less than 15 minutes, sometimes during the day as chosen by the team - not necessarily at startup).
6. Foremen/PM attend training, provided by CMa, to orient to this system (Typically 8 hours.)

E. Last Planner System of Production Control
1. The Last Planner System of Production Control, or LPS, is an important component of lean construction and the one that has been widely implemented. The LPS was developed to produce predictable workflow and rapid learning. This produces maximum value to the Owner and Contractors by eliminating waste cause by unpredictable workflow. Its use has enabled contractors to reduce the delivery time of the project and at the same time allowed specialty contractors to improve utilization of their resources.
2. This requires team members (Owner, Architect, CMa, Prime Contractors and their sub-contractors) to make and keep commitments based on their confidence that prerequisite work, design information, materials, labor and equipment will b ready so they can start and complete installations to meet Master Schedule milestones.

F. Pull Planning Meeting
1. In the Pull Planning Meeting, the CMa will facilitate the meeting such that the each Prime Contractors foremen can structure the flow of work and design the network of commitments by identifying hand-offs between trades.
2. Each Prime Contractors foremen is considered a "Last Planner" in the LPS, and has the responsibility to plan their activities ten to twelve weeks ahead in a "Make Ready Schedule" and to identify crew assignments for the current and next week in a "Weekly Work Plan".
3. Last Planners are asked to commit to performing work that they know can be made ready for their crews and to refuse to assign work they are not confident can be started and/or completed because it is not ready. It is this cycle of planning and commitment coupled with learning from seeing the results which creates reliable workflow.
4. The LPS is based on milestones from the Master Schedule, which are used to identify phases. The effort to determine work flow in the Phase Schedule takes place in a Pull Planning Session involving the Last Planners and in most cases the Project Manager, Owner, CMa, and Designers and Prime Contractors foremen/PM.
5. When this workflow plan is converted to a Gantt chart or CPM type schedule and reformatted/filtered to represent the next six to eight weeks of work, it becomes known as the Make Ready Schedule and is the basis of planning and constraint identification. It also identifies those activities that must be included in the Weekly Work plan (WWP) - the commitment list for the force.
6. Typically, the Make Ready Schedule is developed on the project scheduling system (MS Project, Suretrack, Primavera P6, etc.) and the WWP is based on an Excel spreadsheet.
7. An important part of the LPS is the monitoring and reporting of the teams success in meeting their commitments and the learning devleoped when the failures are discussed, and improvement strategies put in place.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 WEB-BASED PROJECT SOFTWARE SERVICE

A. Web-Based Project Software Service: CMa shall provide, administer, and utilize web-based project software to host and manage project communication and documentation.
   1. This project will utilize a web based Project Management Information System (PMIS) for all facets of the project including but not limited to communication, document control management and invoicing.
   2. Access to the PMIS system shall be granted the entire length of the Project and for 3 months after the final completion date.
   3. All Prime Contractors will submit RFI's and submittals through the PMIS system for processing to CMa and Architect. As part of the training and pre-construction conference, PMIS system work flow will be established.
   4. Prime Contractors are required to submit updated submittal registers on a weekly basis until all submittals have been issued. This shall be uploaded to the PMIS system and sent to the A/E and CMa for coordination.
   5. Software shall be capable of performing the following features:
      a. Project directory, including Owner, CMa, Contractor, subcontractors, Architect, Architect's consultants, and other entities involved in the project. Include names of contact persons and contact information for each entity.
      b. Access control for each entity and for each workflow process to determine each entity's digital rights to create, modify, view, and print documents.
      c. Workflow planning, allowing customization of workflow for each project entity.
      d. Project correspondence.
      e. Creation, logging, tracking, and notification for project communications.
      f. Creation, logging, tracking, and notification for RFI's and submittals.
      g. Tracking of project communication statuses in real time, including timestamped response log.
      h. Procedures for viewing PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
      i. Processing and tracking of payment applications.
      j. Processing and tracking of contract modifications.
      k. Creation and distribution of meeting minutes.
      l. Document management for drawings, specifications, and coordination drawings, including revision control.
      m. Management of construction progress photographs.
      n. Mobile device compatibility.
      o. Creation of data analytics reports.
      p. Creation and export of editable logs for software functions. Provide Owner, Architect, and Architect's consultants with rights and ability to download logs when requested.
   6. Cost:
      a. CMa shall provide up to 5 user licenses for use by each Prime Contractor; Prime Contractor may purchase additional licenses as they deem necessary for themselves, their subcontractors and other entities involved in the project

7. Training: CMa shall provide training on the usage and functionality of the PMIS system. Two (2) training sessions will be scheduled and coordinated within fifteen (15) business days of Owner-Contractor Agreement. All Primes are required to attend one session but may attend both. Further training shall be the responsibility of the user.
    a. Representatives of Owner shall be scheduled and included in this training.
8. Web-Based Project Software Services: The selected service is:
    a. Procore Technologies, Inc; Procore

3.2 PRECONSTRUCTION MEETING

A. CMa shall schedule meeting prior to starting construction, at a time convenient to Owner and Architect, but not later than fifteen (15) business days after execution of Owner-Contractor Agreement.

B. Conduct the conference to review responsibilities, personnel assignments and coordination of Project requirements.

C. Attendees: Authorized representatives of Owner, CMa, and Architect and their consultants; Prime Contractors and their superintendent; Major subcontractors; and other concerned parties shall attend the meeting. Participants shall be familiar with the Project and authorized to conclude matters relating to the Work.

D. Agenda:
1. Review of portions of the executed Agreements affecting the interaction and coordination between the Prime Contractors, the CMa and the Architect.
2. Verify and Review the submission of executed bonds and insurance certificates.
3. Verify date and version of Contract Documents included within the Owner-Contractor Agreement.
    a. Verify that each subcontractor has been provided with all of the Projects Contract Documents, and is fully aware of the requirements for coordination, coordination drawings, and participation within all coordination activities.
4. Identify/Designate key personnel and their duties. Review subcontractor lists and key personnel submittals.
5. Establish communication hierarchy and requirements.
6. Review Construction Schedule, including a discussion of phasing where applicable, critical work sequences, long lead product procurement.
    a. Establish date/time of reoccurring progress meeting.
7. Submission of initial Submittal schedule.
8. Procedures and processing of field decisions, RFI's, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
    a. Discuss submittal procedures. Modify submittal separation or combination of submittals for the purposes of transmitting individual or combined submittals of each Specification Section within a single or multiple transmittals. All requirements for related submittal submissions shall remain unmodified/unchanged.
9. Record Document preparation and procedures.
10. Use of Project site and premises.
    a. Parking
    b. Security
    c. Deliveries, material storage, lay down, and fabrication areas.
    d. Temporary Facilities

11. Work Restrictions.
    a. Work Hours.
    b. Utility shut downs.
    c. Noisy, malodorous, and dusty work.
12. Owner Occupancy
13. Progress cleaning.

E. CMa shall record minutes and post copies to web-based document management software within five days after meeting.

3.3 PREINSTALLATION MEETINGS

A. Conduct preinstallation meetings at Project Site before each construction activity that requires coordination with other construction and as identified in individual specification sections.

B. Attendees: CMa, 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 Owner and Architect of scheduled meeting time/date.

C. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements of/for the following:
1. Contract Documents
2. Related RFI's
3. Related Change Orders or other modifications to the Contract Documents.
4. Submittals marked other then Rejected, Revised and Resubmit, or Returned Without Action.
5. Review of mock-ups.
6. Possible conflicts and compatibility issues.
7. Schedules.
8. Weather limitations.
9. Manufacturer's information; Written instructions and recommendations, warranty requirements.
10. Acceptability of substrates.
11. Coordination with other work.
12. Protection of other work and existing improvements.

D. Do not proceed with installation if the meeting cannot be successfully concluded. Initiate actions necessary to resolve impediments to performance of the Work and reconvene the meeting at the earliest possible date/time.

E. CMa CMa shall record minutes and post copies to web-based document management software within five days after meeting.
1. Record significant meeting discussions, agreements, and disagreement, including required corrective measures and actions.

3.4 PROGRESS MEETINGS

A. Shall be coordinated and scheduled at the PreConstruction Meeting and shall be administered throughout progress of the work at bi-monthly (every two weeks) intervals.

B. CMa will make arrangements for meetings and preside at meetings.

C. Attendees: Owner/Owner Representative, Architect, Prime Contractors, other approved guests, and CMa; Approved guests shall include any representative of an entity familiar with the project authorized to conclude matters relating to the Work that has been requested to attend and approved by either the Architect or the Owner.

D. Agenda for progress meetings shall be set by the previous meeting minutes and shall consist of the following:
   1. Review minutes of previous meetings.
   2. Review Lean procedures.
   3. Review of work progress.
   4. Field observations, problems, and decisions.
   5. Critical Work sequencing and interface requirements; Identification of problems that impede, or will impede, planned progress.
   6. Review of submittals schedule and status of submittals.
   7. Review of RFIs log and status of responses.
   8. Review of off-site fabrication and delivery schedules.
   9. Construction Schedule: Review progress since last meeting. Determine where each activity is in relation to the Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behnd 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.
   10. Corrective measures to regain projected schedules.
   11. Planned progress during succeeding work period.
   12. Coordination of projected progress.
   13. Maintenance of quality and work standards.
   14. Effect of proposed changes on progress schedule and coordination; Bulletins and Change Orders.
   15. Security
   16. Housekeeping
   17. Preparation and maintenance of record documents.
   18. Applications for Payment and pencil copies.
   19. Certified Payroll.
   20. Waivers and Releases.
   21. O&M Manuals, Warranties.
   22. Start-ups and Commissioning.
   23. Safety.
   24. Other business relating to work.

E. CMa shall record minutes and post copies to web-based document management software within five days after meeting.

F. Construction Schedule Update: Contractor shall revise Contractor's Construction Schedule after each progress meeting where revisions to the scedule have been made or recognized during the Progress Meeting. Contractor shall post copies of revised schedule to web-based document management software within three days after the meeting.

3.5 COORDINATION MEETINGS

A. CMa will conduct Project Coordination Meetings at regularly scheduled time intervals, no less than monthly. The meeting frequency will be increased as the discretion of the CMa. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings, pre-installation meetings, and pre-construction meeting.

B. Attendees: In addition to Owner, CMa, 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 meetings shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   1. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule in relation to the combined 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.
   2. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
   3. Review present and future needs of each contractor present, including the following:
      a. Interface requirements
      b. Sequnce of operations.
      c. Status of submittals.
      d. Deliveries.
      e. Off-site fabrication.
      f. Access.
      g. Site utilization.
      h. Temporary facilities and controls.
      i. Work hours.
      j. Hazards and risks.
      k. Progress Cleaning
      l. Quality and Work standards.
      m. Modifications to the Contract.
      n. Safety.
   4. Reporting: CMa will record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

3.6 LEAN TRAINING AND PULL PLANNING MEETING

A. CMa will schedule and conduct a Lean Training and Pull Planning Meeting after submission of the Start-up/Preliminary Construction Schedule, but no later than twenty (20) business days of Owner-Contractor Agreement.
   1. CMa to conduct the conference to train and familiarize all required project personnel, inclusive of each Prime Contractor and key sub-tier contractors, with Lean procedures and then, as the foundation of

the Lean process, develop a Pull Plan for a phase of the project based on the project knowledge of each participant having developed their individual start-up schedules.
2. Allow a minimum of 12 hours over 2 days for all required personnel.
3. Attendees: Owner, CMa, Architect and their consultants, contractor and its superintendent, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

3.7 LAST PLANNER MEETINGS

A. CMa will facilitate Last Planner Meetings on a weekly basis. The purpose of the meetings is to plan and coordinate the near-term work to allow coordination between Prime Contractors and the subcontractors.
1. CMa will conduct the conference to develop and improve workflow on the project site based on commitments made and evaluation of results.
2. Required Attendees: CMa, area foremen for each of the Prime Contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
3. Topics may include the following:
    a. Interface requirements
    b. Sequnce of operations.
    c. Status of submittals.
    d. Deliveries.
    e. Off-site fabrication.
    f. Access.
    g. Site utilization.
    h. Temporary facilities and controls.
    i. Work hours.
    j. Hazards and risks.
    k. Progress Cleaning
    l. Quality and Work standards.
    m. Modifications to the Contract.
    n. Safety.
4. Minutes: CMa will record and distribute meeting minutes.

3.8 LEAN DAILY HUDDLES

A. CMa will conduct Lean Daily Huddles.

B. CMa will facilitate the huddle to review work plans, evaluate performance against commitments and make adjustments to daily planned activities.

C. Allow a minimum of 30 minutes per day for required attendees.

D. Required Attendees: CMa, area foremen for each of the Prime Contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

3.9 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216 - CONSTRUCTION PROGRESS SCHEDULE

3.10 DAILY CONSTRUCTION REPORTS

A. CMa will prepare a daily construction report recording the following information concerning events at Project site and project progress:
   1. Date.
   2. High and low temperatures, and general weather conditions.
   3. List of subcontractors at Project site.
   4. List of separate contractors at Project site.
   5. Approximate count of personnel at Project site.
      a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, helpers, and others.
   6. Major equipment at Project site.
   7. Material deliveries.
   8. Safety, environmental, or industrial relations incidents.
   9. Unusual events (submit a separate special report).
   10. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
   11. Services connected and disconnected and meter readings and similar recordings.
   12. Emergency procedures implemented.
   13. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
   14. Change Orders received and implemented.
   15. Testing and/or inspections performed.
   16. List of verbal instruction or Construction Change Directives given by CMa, Owner and/or Architect.
   17. List of and partial completions or occupancies.
   18. Signature of Contractor's authorized representative.

B. Site Condition Reports: Immediately upon discovery of a difference between site conditions and the Contract Documents, summarize discrepancy within daily report and prepare and submit a separate detailed report to the Architect. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

3.11 PROGRESS PHOTOGRAPHS

A. Progress photographs shall include Pre-construction photographs, progress photographs, and Final completion construction photographs.

B. Digital Photographs:
   1. Digital Device: Camera or other device capable of producing a minimum of 4 megapixel digital photographs.
   2. Format: Minimum 2688 x 1520 pixel layout/size, in unaltered original files, with same aspect ratio as produced by the sensor, and un-cropped.
   3. Identification and Storage: Digital photographs shall contain time, date, and GPS metadata and shall be labeled and shared as follows:

a. Digital files shall be named with sequential number and date the image was taken.
b. Digital files shall be uploaded to web-based document software weekly unless photographs are intended to be utilized for immediate discussion and coordination.

4. Usage Rights: Photographer shall release/transfer copyright usage rights to Owner, Architect, and Contractor for unlimited reproduction and photographic documentation.

C. Preconstruction Photographs: Before starting construction operations, take photographs of Project site, surrounding properties, existing items to remain undisturbed, and existing items to be salvaged, from different vantage points.
1. Flag construction limits before taking pre-construction photographs.
2. Take photographs to show existing conditions adjacent to property, adjacent to limits of disturbance, and adjacent to areas of work before starting the Work.
3. Take photographs of existing buildings both located on the property where work is being performed and on adjacent properties to accurately record the physical conditions at the start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Construction Progress Photographs
1. Architect-Directed Construction Photographs: At the Architects discretion, the Architect shall direct the Contractor to take construction progress photographs of ongoing construction activities or in-place construction. The Architect shall provide direction on number of photographs, subject of photographs, vantage points, and other required information to provide the Architect with appropriate detail for coordination or utilization of digital imagery.
2. Contractor Initiated Construction Photographs: Contractor shall take photographs of ongoing construction activities or in-place construction as may be necessary to coordinate construction activities, assist in the resolution of RFI's or other similar correspondence and information items.
3. In addition to periodic, recurring views, take photographs of each of the following events:
a. Completion of site clearing.
b. Excavations in progress.
c. Foundations in progress and upon completion.
d. Structural framing in progress and upon completion.
e. Enclosure of building, upon completion.
f. Final completion, minimum of thirty (30) photos.

3.12 COORDINATION PROCEDURES, GENERAL

A. Each Contractor (Prime/General Contractor(s), Subcontractors, and Suppliers) shall be responsible for the coordination of the Work as it pertains to or has an affect/effect on their Work. Each contractor shall be required to participate in the coordination process. The Contract Documents do not specify, beyond major contract packages of a multi-prime Project, specific items or areas of subcontractor responsibility. It is each Prime Contractors responsibility to perform all the Prime Contractors Contract Package as indicated within the Contract Documents and assign portions of such work to Subcontractors as they deem necessary.
1. Where Work has been split between multiple subcontractors, suppliers, installers, the Prime/General Contractor shall be responsible for coordinating and combining the submission of submittals for systems and/or portions of systems such that the Architect can review each portion with its related components. The Architect shall notify the Prime/General Contractor if additional information or additional submittals are required and when the submittal(s) received was not properly coordinated or

if it was/were received with insufficient information to complete a review. Submittal review time shall not start until a coordinated and complete submission of submittals is received by the Architect.

B. Coordinate construction operations included in different Sections of the Specifications/Project Manual 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 upon installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair/replacement.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare notice/memorandum for distribution to each party involved, outlining special procedures required for coordination. Include such items including but not limited to, required notices, reports, Specification Sections, and list of attendees at meetings.
1. Prepare similar notice/memorandum for Owner and separate contractors if coordination of their Work is effected/affected by or effects/affects the Work.

D. Accessibility in limited Space: Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction 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. Start-up and adjustment of systems.

F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.13 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to the requirements in individual Sections. Furthermore, prepare coordination drawings where installation of the Work is not completely shown on Shop Drawings, where limited space availability necessitates coordination, where coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity, or where the installation of systems indicated to be diagrammatically represented must integrate with systems or materials that require specific dimensional/spatial installation requirements.

B. Content: Project specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Where digital files of Contract

Documents are utilized to create coordination drawings, the Contractor shall be responsible for integrating actual field conditions known at the time of development of the coordination drawings along with submittal information marked *Approved* or *Approved, Comments Noted* or similar marking. Coordination drawings shall at a minimum include the following as may be applicable:

1. Plans, sections, elevations, and details required to describe the relationship of various systems and components required to be integrated with one another.
2. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
3. Indicate space requirements for routine maintenance and for anticipated replacement of components during life of the installation.
4. Show location and size of access doors required for access to concealed dampers, valves, and controls.
5. Indicate required installation sequence.
6. Indicate critical dimensions shown on drawings. Specifically note dimensions that appear to be conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

C. Review drawings prior to submission to CMa and Architect.

3.14 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
1. Where RFI's responses will affect the project schedule critical path, submit requests immediately upon discovery.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
   a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
   b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to CMa.
   a. Use AIA G716 - Request for Information .
3. Prepare using software provided by the Electronic Document Submittal Service.
4. Combine RFI and its attachments into a single electronic file. RFI and attachments shall be provided in PDF format. Other formats may be acceptable must must be approved by the Architect prior to submission.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response will be returned without a response.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question will be returned without a response.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the CMa and Architect, and any of its consultants, due to processing of such RFIs.
   5. RFI's submitted by other than the Prime Contractors: Requests not submitted by the Prime Contractors will be returned without a response.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. CMa, Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: CMa will prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. Highlight items for which a timely response has not been received to date.
   5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within a reasonable time frame as may be applicable to the RFI content and resolution of RFI issues. If the response of an RFI requires more than fourteen (14) calendar days, the design team shall notify the Contractor of the anticipated response time. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses (Archtiect's Action):
   1. Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly (within fourteen (14) calendar) issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   2. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   3. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   4. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   5. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.15 SUBMITTAL SCHEDULE

A. Submit to CMa for review a schedule for submittals in tabular format arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

B. Within five (5) business days after date of the execution of the Contract/Agreement, submit preliminary submittal schedule for review.
   1. Submission of submittals should not be delayed pending review of schedule. Submittal submission shall immediately commence in accordance with submission requirements of the Contract Documents

C. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   1. Include/Indicate submittals required during the first 60 days of construction as well as those submittals with long lead times for manufacturing and fabrication.

D. Coordinate with Contractor's construction schedule and schedule of values.

E. Format schedule to allow tracking of status of submittals throughout duration of construction.

F. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.

G. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
   1. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
   2. Where Work has been split between multiple subcontractors, suppliers, installers, the Prime/General Contractor shall be responsible for coordinating and combining the submission of submittals for systems and/or portions of systems such that the Architect can review each portion with its related components. The Architect shall notify the Prime/General Contractor if additional information or additional submittals are required and when the submittal(s) received was/were not properly coordinated or if it was received with insufficient information to complete a review. Submittal review time shall not start until a coordinated and complete submission of submittals is received by the Architect.
   3. Submittals requiring selection of colors will not be fully reviewed until all related items requiring color selection are submitted respectively. Furthermore, no colors shall be selected until the Owner has selected a color scheme based upon the submitted samples of finishes.
      a. For example: no exterior color selections shall be made until samples of all exposed materials on the exterior of the building have been submitted, color boards presented to the Owner and the Owner has selected/approved the finish selections presented on the color board(s).

3.16 SUBMITTALS FOR REVIEW

A. Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "Action Submittals" or "Submittals for Review".

B. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Design data.
   3. Delegated Design Data
      a. Signed and sealed documents, drawings, and calculations.
   4. Shop drawings.
   5. Samples for selection.
   6. Samples for verification.

C. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

D. Samples will be reviewed for aesthetic, color, or finish selection and texture.

E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.17 SUBMITTALS FOR INFORMATION

A. Written and graphic information and physical samples that do not require Archtiect's responsive action. Submittals may be rejected for not complying with requirements. Information submittals are those

submittals indicated in individual Specification Sections as "Information Submittals" or "Submittals for Information".

B. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Sustainability design submittals and reports.
   3. Certificates.
   4. Test reports.
   5. Inspection reports.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Field engineering daily reports.
   9. Other types indicated.

C. Submit for CMa and/or Architect's knowledge as contract administrator or for Owner.

3.18 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Final Property Survey.

E. Submit for Owner's benefit during and after project completion.

3.19 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one original electronic copy in PDF format; an electronically-marked up file of the Contract Documents is not acceptable and will be returned unless specifically noted otherwise. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.20 SUBMITTAL PROCEDURES

A. General Requirements:
1. Unless otherwise discussed and approved by the CMa, Architect and the Owner at the PreConstruction Meeting, submit separate packages of Submittals for Review and Submittals for Information, when included in the same specification section.
2. Transmit using approved form.
   a. Use form generated by Electronic Document Submittal Service software. Where no form is generated by the Electronic Document Submittal Service or Document Management Service, use Contractor's form, subject to prior approval by Architect.
   b. Transmittal shall indicate at a minimum, the following information:
      1) Official Project name and number, and any additional required identifiers established in Contract Documents.
      2) CMa, Owner's, Architect's, and Contractor's names.
      3) Category and Type of Submittal
         a) Category: Submittal for Review or Submittal for Information
         b) Type: Product Data, Shop Drawings, Samples, Warranty Information, Design Data, etc.
      4) Submittal Number; Multi-Prime Contract Package Number, Division Number, Specification Number, Sequential Item Number, Sequential Submission Number.
3. Submittal Numbering
   a. Submittal Number; Multi-Prime Contract Package Number, Division Number, Specification Number, Sequential Item Number, Sequential Submission Number.
      1) Multi-Prime Contract Package #: **01**-06-1000.01.01
      2) Division Number: 01-**06**-1000.01.01
      3) Specification Number: 01-06-**1000**.01.01
      4) Sequential Item Number: 01-06-1000.**01**.01
      5) Sequential Submission Number: 01-06-1000.01.**01**
   b. For Multi-Prime projects begin the Submittal number with the 2-digit contract package number.
      1) Example Submittal Number:
         a) For a Multi-Prime General Construction package, all submittals shall begin with **01**. Resulting in a submittal number thus: **01**-06-1000.01.01.
         b) For a Multi-Prime Plumbing package, all submittals shall begin with **22**. Resulting in a submittal number thus: **22**-06-1000.01.01
4. Additional Submittal Information required:
   a. Provide the following information with each submittal. Information can be included within the transmittal or can be provided on a separate submittal cover sheet. Where a separate submittal cover sheet is provided, include all the information required to be on the transmittal, on the cover sheet along with the following:
      1) Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
      2) Provide space for Contractor and Architect review stamps.
      3) Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
         a) Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.

b. Identify by highlighting or other identification method, relevant product data including but not limited to, options, specific model information and other relevant information where various non-relevant information exits within the submitted materials. Submittal will be returned without action where relevant information is not identified.
c. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
d. When revised for resubmission, identify all changes made since previous submission.

5. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
6. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   a. Submittals not requested will not be recognized or processed.
7. Submittals not requested will be recognized, and will be returned "Not Reviewed".
8. Resubmittals: Make revisions as necessary to comply with the requirements of the Contract Documents and the comments of the previous submittal review. Format the resubmittals as required for the initial submittal and provide all information. Number resubmittals sequentially by modifying the last 2 digits of the submittal number to the next highest number.
   a. If a submittal is resubmitted without modification from the original submittal or without the requested information or compliance with the review comments of the previous submittal, the submittal will be returned without action. Where more than two (2) non-compliant resubmittals are received and returned without action due to non-compliance with the Contract Documents, or the comments of the previously submitted and returned submittals, the Contractor shall be required to compensate the Owner for additional services for multiple reviews of non-compliant submittals.
9. Retain copies of submittals on site, that have completed the submittal review process. Utilize only final action submittals that are marked with approving actions indicated within the the Architect's Submittal Review and Transmittal Form.

B. Submittal Processing Time
1. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
   a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   b. Send submittal in electronic format via email to Architect.
2. Where Work has been split between multiple subcontractors, suppliers, installers, the Prime/General Contractor shall be responsible for coordinating and combining the submission of submittals for systems and/or portions of systems such that the Architect can review each portion with its related components. The CMa shall notify the Prime/General Contractor if additional information or additional submittals are required and when the submittal(s) received was/were not properly coordinated or if it was received with insufficient information to complete a review. Submittal review time shall not start until a coordinated and complete submission of submittals is received by the Architect
3. Submittals requiring selection of colors will not be fully reviewed until all related items requiring color selection are submitted respectively. Furthermore, no colors shall be selected until the Owner has selected a color scheme based upon the submitted samples of finishes.
   a. For example: no exterior color selections shall be made until samples of all exposed materials on the exterior of the building have been submitted, color boards presented to the Owner and the Owner has selected/approved the finish selections presented on the color board(s).
4. Schedule submittals to expedite the Project, and coordinate submission of related items. The following submittal processing times are estimated processing times. The Architect will attempt to

provide submittal reviews within the time frame indicated however additional time may be necessary to review complex, large, or simultaneously provided submittal packages. The Architect will notify the Contractor if the Architect believes the submittal review will extend beyond the time frames indicated below. Submittal review time beyond the time frames indicated below will not be cause for extension to the Contract Time or the Contract Sum. It is the Contractor's responsibility to coordinate submittal submissions to allow for processing time.

a. For each submittal for review, allow 15 business days excluding delivery time to and from the Contractor.
b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 calendar days for each entity or consultant required to review the submittal.
c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 calendar days.

C. Product Data Procedures:
1. Submit only information required by individual specification sections.
    a. Mark each copy of each submittal to show which products and options are applicable.
    b. Where more than one product or where a single product has different options for different applications, submit a separate product data package for each product or different configuration of a single product is required.
    c. Include the following information, as applicable:
        1) Manufacturer's catalog cut sheets.
        2) Manufacturer's product specifications; modify or indicate appropriate information. Unmodified general specifications including information not applicable to the specified product shall not be acceptable.
        3) Standard or custom color charts or color chips/rings.
        4) Statement of compliance with specified reference standards.
        5) Testing by recognized testing agency.
        6) Application of testing agency labels and seals.
        7) Notation of coordination requirements.
        8) Availability and delivery information.
    d. For equipment, include the following in addition to the above, as applicable:
        1) Wiring diagrams showing factory installed wiring.
        2) Printed performance curves.
        3) Operational range diagrams.
        4) Clearances required to other construction, if not indicated on accompanying Shop Drawings.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.
5. Submit sustainable design reporting submittals under separate cover.
6. If information must be specially prepared for submittal because standard published data is not suitable for use, submit as a Shop Drawing, not as product data.

D. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work. Digital data files may be procured from the design team (Architect and Architect's consultants) as a convenience to the contractor, are not guaranteed, and are only available for conditional use as stipulated by the "Release For Transmission of Digital Data".

2. Do not reproduce Contract Documents to create shop drawings.
3. Digital data files including but not limited to CAD (.dwg) or Revit (.rvt) may be purchased from the design team (Architect or Architect's consultants) directly at a cost of One Hundred Dollars ($100.00) per sheet or drawing. The following stipulations apply to the transmission of digital data files and shall be accepted by the purchaser as conditional use of the files.
    a. Release For Transmission of Digital Data: The digital data furnished is solely for the exclusive and limited use of the purchaser receiving the data, and solely in direct connection with the Project. The data has been generated by Manns Woodward Studios, Inc. and/or the consultants of Manns Woodward Studios, Inc.; the details and design intent in the data is the intellectual property of the entity who generated the data. Use of this data in any way for any other project or application represents infringement of Manns Woodward Studios, Inc. copyright. The party (the purchaser) receiving the data shall, to the fullest extent permitted by law, indemnify and hold harmless Manns Woodward Studios, Inc, its consultants and the Project Owner from all claims, damages, losses, liability, and expenses, including attorney's fees arising out of or resulting from the use of the data. The recipient (purchaser) acknowledges that any use of this digital data represents full acceptance of and agreement with the terms of this release. Manns Woodward Studios, Inc. and its consultants make no warranty or guarantee, either assumed or implied, as to the accuracy of this data. The purchaser accepts that the use of the transmitted data is at the sole risk of the purchaser. The recipient (purchaser) of the digital data shall not transmit the digital data, or materials prepared from this digital data to other entities/parties without first obtaining acceptance in writing from the other entity/party a Release For Transmission of Digital Data including all the stipulations of this Release For Transmission of Digital Data.
4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

E. Samples Procedures:
1. Transmit related items, accessories and integrated/related components, together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
    a. Attach label on unexposed side of samples. Include the following information on label:
        1) Product Name and name of manufacturer.
        2) Sample source.
        3) Number and title of Specification Section, Specification paragraph, and generic name of each item.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

F. Certification or Certificate Submittals:
1. Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer of other individual authorized to sign documents on behalf of that entity.

3.21 SUBMITTAL REVIEW

A. Contractor's Review
1. Contractor is required to review each submittal for general compliance with the Contract Documents. Any submittal received by the Architect that has not been reviewed by the Contractor, in the opinion

of the Architect, that represents a blatant disregard of the Contractors responsibilities to review the submittal for compliance, shall be returned to the Contractor without action. Multiple submissions of a submittal representing a blatant disregard for the Contractors responsibility shall be cause for the Contractor to reimburse the Owner for the additional services of the Architect and the Architect's consultants. In addition, the Contractor may be liable for damages owed to the Owner for any project delays or other costs resulting from multiple reviews of non-compliant submittals.

2. Contractor shall provide and indication of review and approval on each submittal.
3. Contractor shall not provide Architect with any submittal until it has been reviewed and approved by the Contractor.

B. Architect's and Architect's Consultants Review

1. Architects review is only for the general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. Corrections or comments made on the Submittal during this review fo not relieve the Contractor from complying with the requirements of the Contract Documents or any AHJ (Authority Having Jurisdiction). Review of a specific item shall not be deemed a review of the assembly of which the item is a component. The Contractor is responsible for (1) confirmation and correlation of all quantities and dimensions at the job site, (2) information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction, (3) the coordination of work with all other trades (4) for performing all work in a safe and satisfactory manner, and (5) coordinating substrates and attachments to substrates/supporting materials.
2. Submittals for Review: Architect will review each submittal, make marks to indicate corrections or revisions required or identify additional information required for a complete review, or take other appropriate action.
3. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
4. Architect's actions will be reflected by completing and attaching a "Submittal Review and Transmittal" form for each returned submittal.
    a. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
5. Architect's actions on items submitted for review:
    a. General: The "Action" indicated on the "Submittal Review and Transmittal" form identifies the appropriate deemed "Actin" for the indicated Submittal. The "Action" indicated on the form is based upon a review of the Contractor's submittal but is only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of the submittal is not conducted for the purpose of determining the accuracy and completeness of the other details such as dimensions and quantities, or for substantiating instructions for installation; All of which remains the responsibility of the Contractor. The Contractor shall not be relieved responsibility for deviating from requirements of the Contract Documents by the Architects "Approval" of submittals. The Contractor shall not be relieved of responsibility for errors or omissions in the Shop Drawings, Product Data, Samples, or similar submittals by the Architect's "Approval" thereof.
    b. Architect's Actions Definitions
        1) "**Approved**": Submittal conforms with information given and the design concept in the Contract Documents.
        2) "**Approved, Comments Noted**": Submittal conforms with information given and the design concept expressed in the Contract Documents except as noted. Contractor shall coordiante and/or adjust submittal information/Contractor work plan to conform to the information given

and the design concept expressed in the Contract Documents. DO NOT RESUBMIT unless noted otherwise.

a) Comments may include the statement to "revise and resubmit for record". Where the statement "revise and resubmit for record" is part of the comments, the Contractor shall resolve or incorporate the comments as may be applicable, shall proceed with the work dependent upon the submittal and also revise and resubmit the submittal for record purposes. Submittals received for record purposes will not be returned.

3) "**Revise and Resubmit**": Submittal does not conform with information given and/or the design concept expressed in the Contract Documents. Contractor shall coordinate and/or adjust submittal information/Contractors work plan to conform to the information given and the design concept expressed in the Contract Documents and resubmit the submittal.
4) "**Rejected**": The submittal is non-compliant. The Architect shall provide a reason for non-compliance. Contractor is responsible for providing a compliant submittal.
5) "**Returned without Action**": Submittal is defined within the Contract Documents as a submittal that does not get a review or response from the Architect. The Architect may provide comments to submittals returned without action.

6. Architect's and consultants' actions on items submitted for information:
   a. "Returned without Action": Submittal is defined within the Contract Documents as a submittal that does not get a review or response from the Architect. The Architect may provide comments to submittals returned without action.

END OF SECTION 01 3000

410.344.1460
8098 Sandpiper Cir Suite H
Nottingham, MD 21236

STUDIOS
ARCHITECTURE
MASTER PLANNING

SUBMITTAL REVIEW AND TRANSMITTAL

Project:	Owner:
Project Name Address 1 Address 2 Address 3	Owner Representatives Name Owner Company Name Address 1 Address 2

Contractor:	Architect:	
Contractor Representative Contracting Company Name Address 1 Address 2	Reviewer Name MW Studios 8098 Sandpiper Cir, Suite H Nottingham, MD 21236	Project Number: xx-xxx

SUBMITTAL

Submittal Number - Name

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. The purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

ARCHITECTS ACTION

By: Reviewer Name
Date: 01/01/1234

The following indicated "ACTION" is the appropriate deemed "ACTION" for the above indicated "SUBMITTAL". The "ACTION" indicated below is based upon a review of the Contractors "SUBMITTAL" but is only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of such "SUBMITTAL" is not conducted for the purpose of determining the accuracy and completeness of the other details such as dimensions and quantities, or for substantiating instructions for installation; All of which remains the responsibility of the Contractor. The Contractor shall not be relieved of responsibility for deviating from requirements of the Contract Documents by the Architects "Approval" of Shop Drawings. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar Submittals by the Architects "Approval" thereof.

☐	**Approved**	Submittal conforms with information given and the design concept expressed in the Contract Documents
☐	**Approved, Comments Noted**	Submittal conforms with information given and the design concept expressed in the Contract Documents EXCEPT AS NOTED. Contractor shall coordinate and/or adjust submittal information/Contractors work plan to conform to the information given and the design concept expressed in the Contract Documents. DO NOT RESUBMIT unless noted otherwise.
☐	**Revise and Resubmit**	Submittal does not conform with information given and the design concept expressed in the Contract Documents. Contractor shall coordinate and/or adjust submittal information/Contractors work plan to conform to the information given and the design concept expressed in the Contract Documents. RESUBMIT.
☐	**Rejected**	
☐	**Returned without Action.** See comments.	

01/01/1234
Submittal Number - Name

COMMENTS:
1. See ARCHITECTS ACTIONS
2. Contractor shall coordinate submittal information and schedule of the Work with all trades.
3. Dimensional and quantity mark-ups are intended to convey conformance with design concept expressed in the Contract Documents. Contractor remains responsible for given information provided within the Contract Documents and the coordination of all quantities and dimensions with the Work and the existing conditions.

ADDITIONAL COMMENTS:
4.

SECTION 01 3216 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 GENERAL

A. The CMashall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Prime Contractors with each other and with those of the CMa, the Owner, and the Architect. The CMa shall assist in coordination of the Prime Contractor's activities in accordance with the latest Approved Master Project Schedule and the Contract Documents.

B. Prime Contractors shall provide the documentation of the progress of construction during performance of the Work and includes, but is not limited to:
1. Preliminary Construction Schedule.
2. Prime Contractor's Construction Schedule.
3. Submittal Schedule.
4. Progress Schedule.
5. Daily Construction Reports and Progress Reports.
6. Schedule of Values and Trade Payments Breakdowns.
7. Construction Survey Data.
8. Material Location Reports
9. Field condition reports.
10. Special Reports.
11. Construction Photographs.

1.2 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

1.3 RELATED SECTIONS

A. Section 01 1000 - Summary: Work sequence, occupancy, and owner-furnished items.

B. Section 01 3000 - Administrative Requirements: For submitting schedules and reports.

1.4 DEFINITIONS

A. Activity: A discrete part Project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The breakdown of the Contract Amount and assignment of specific costs to each activity in the Baseline Schedule. The sum of costs for all activities must equal the total Contact Sum unless otherwise approved by the Owner, Architect and Construction Manager.

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 connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

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 is not for the exclusive use or benefit of either the Owner or the Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
   4. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

G. Milestone: A key or critical point in time for reference or measurement. A milestone activity has no duration and identifies a significant date in the schedule network. Milestones can be start or finish type.

1.5 SUBMITTALS

A. Within 14 calendar days after date of the execution of the Contract/Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
   1. Provide list of major subcontractors (any subcontractor assigned more than 5% of the Work of the Contract Package.)
   2. Provide list of long lead time items.

B. If preliminary schedule requires revision after review, submit revised schedule within 2 calendar days.

C. Within 30 calendar days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Submit updated schedule with each Application for Payment.

E. Submit schedules in PDF format.

F. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, 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 activity number and then early start date, or actual start date if known.
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.
3. Total Float Report: List of all activities sorted in ascending order of total float.

G. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements.

1.6 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with five (5) years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.7 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of major subcontractors, submittal schedule, progress reports, payment requests, and other required schedules.
1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.8 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 22 x 17 inches.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.2 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

1. Include, within schedule, constraints and work restrictions indicated in the Contract Documents and as follows. Show how the sequence of the Work is affected.
   a. Work Restrictions:
      1) Coordination with existing construction.
      2) Coordination with Occupants.
      3) Use of site and premises restrictions.
      4) Environmental controls.
   b. Construction Areas: Identify each major areas of construction for each major portion 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:
      1) Structural Completion
      2) Temporary enclosure and space conditioning
      3) Permanent space enclosure
      4) Completion of mechanical installation
      5) Completion of electrical installation.
      6) Substantial Completion.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary and as follows:
   1. Submittals
   2. Fabrication
   3. Delivery
   4. Mockups
   5. Installation
   6. Testing and Inspections
   7. Adjusting
   8. Curing
   9. Startup and placement into final use and operation.

E. Provide sub-schedules to define critical portions of the entire schedule.

F. Include conferences and meetings in schedule.

G. Include implementation and termination dates for temporary facilities and utilities.

H. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

I. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

J. Indicate delivery dates for owner-furnished products.

K. Coordinate content with schedule of values specified in Section 01 2000 - Price and Payment Procedures.

L. Provide legend for symbols and abbreviations used.

3.3 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
1. Preceding and following event numbers.
2. Activity description.
3. Estimated duration of activity, in maximum 15 day intervals.
4. Earliest start date.
5. Earliest finish date.
6. Actual start date.
7. Actual finish date.
8. Latest start date.
9. Latest finish date.
10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
11. Monetary value of activity, keyed to Schedule of Values.
12. Percentage of activity completed.
13. Responsibility.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
2. By amount of float, then in order of early start.
3. By responsibility in order of earliest possible start date.
4. In order of latest allowable start dates.
5. In order of latest allowable finish dates.
6. Contractor's periodic payment request sorted by Schedule of Values listings.
7. Listing of basic input data that generates the report.
8. Listing of activities on the critical path.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
2. Unanswered Requests for Information
3. Rejected or un-returned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with CMa and Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 2 calendar days.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, CMa, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION 01 3216

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Soil investigation data.

B. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.

C. Section 01 3000 - Administrative Requirements: Submittal procedures.

D. Section 01 4216 - Definitions.

E. Section 01 4219 - Reference Standards.

F. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.3 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories.

1.4 DEFINITIONS

A. Quality-Assurance Services: Actvities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiiencies and substantiate that proposed construction will comply with requirements.

B. Mock-ups: Full size physical assemblies that are constructed on-site. Mock-ups 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 demonstate compliance with specified installation tolerances. Mock-ups are not Samples and Samples are not Mock-ups. Unless otherwise indicated, approved mock-ups establish the standard by which the Work will be judged.
1. Mock-ups shall identified either on drawings or within individual product specification sections.

C. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

D. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
1. Design Services Types Required:
    a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor’s sole responsibilities for construction means, methods, techniques, sequences, and procedures.
    b. Design-Related (Delegated Design): Design services (Delegated Design) explicitly required to be performed by another design professional for a specific, specialized, or highly technical portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design. Design services (Delegated Design) requires services to be performed by an engineer licensed within the state and/or jurisdiction in which the project is located unless otherwise noted.

E. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.5 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary hoist(s) and rigging.
5. Investigation of soil conditions to support construction equipment.

1.6 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.
1. Submit a Request for Information to CMa if the criteria indicated are not sufficient to perform required design services.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Contractor's Quality Control (CQC) Plan: For quality-assurance and quality-control activities and responsibilities.

C. Designer's Qualification Statement: Submit for CMa's knowledge as contract administrator, or for Owner's information.
1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
a. Full name.
b. Professional licensure information.
c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

D. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

E. Test and Inspection Reports: After each test/inspection, reports will be promptly submitted to CMa, Architect, Owner, and Contractor.
   1. Reports will Include:
      a. Date issued.
      b. Project title and number.
      c. Name and of personnel conducting test and/or inspection.
      d. Date, time, and site conditions at time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location of test and/or inspection within the Project.
      g. Type of test/inspection and description of test and/or inspection method.
      h. Date of test/inspection.
      i. Results of test/inspection including all data collected.
      j. Statement indicating compliance of results with Contract Documents. Include recommendations for retesting and reinspecting.
      k. Provide interpretation of results.
   2. Test report submittals are for CMaand Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

F. Test and Inspection Log
   1. CMa will prepare a record of tests and inspections. Include the following:
      a. Date the test or inspection was performed.
      b. Description of the Work tested or inspected.
      c. Date test or inspection report was transmitted to Architect.
      d. Identification of testing agency or special inspector conducting the test or inspection.
      e. Compliance or non-compliance with requirements.
      f. Whether or not corrective action was taken or recommended.
   2. Post changes and revisions to the log as they occur. Provide access to Architect and Owner for reference and information.

G. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

H. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing for information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

I. Manufacturer's Field Reports: Submit report documenting manufacturer's technical representatives observations, testing results, and inspection results.
   1. Submit report within 7 calendar days of performance of observations, testing, and inspection to Architect for information.

2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
3. Include within the report the following information:
   a. Name and signature of technical representative who performed observations, tests, inspections and making report.
   b. Statement indicating suitability of conditions of substrates and surfaces.
   c. Statement that products/equipment at Project site comply with requirements of Contract Documents.
   d. Summary of installation procedures being followed/performed, whether they comply with requirements and, if not, what corrective action was taken.
   e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   f. Statement indicating whether conditions, products, and installation will affect warranty.
   g. Other items indicated within individual Specification Sections.

J. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Contractor's Quality Control (CQC) Plan:
1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
   a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
      1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
   b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
      1) Management and control of documents and records relating to quality.
      2) Communications.
      3) Coordination procedures.
      4) Resource management.
      5) Process control.

6) Inspection and testing procedures and scheduling.
7) Control of noncomplying work.
8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
9) Control of testing and measuring equipment.
10) Project materials certification.
11) Managerial continuity and flexibility.

c. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.

d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.
1. Quality control personnel managing the CQC shall have prior experience perofrming similar duties within the jurisdiction that the Work is being performed. Additionally, the manager of the plan shall have successfully completed the management of a CQC for a project with similar scope and work tasks as the Project.

E. Highest Quantity and/or Highest Quality: Should the Contract Documents establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall include within the Contract Sum and account for in the Contract Time the furnishing and installation of the most stringent requirement, the higher quantity, and the higher quality. The Contractor shall submit a Request for Information to clarify the differing or conflicting requirements prior to initiating the Work of the differing or conflicting requirements

1.9 REFERENCES AND STANDARDS - SEE SECTION 01 4219

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner, unless otherwise indicated, will employ the services of an independent testing agency to perform testing and inspections as specified within the Contract Documents and may be required by any Authority Having Jurisdiction over the Project.
1. Hazardous Materials Testing of Soils: General Contractor - Contract Package GC-01 shall be responsible for employing the services of an independent agency, approved by and licensed/certified to perform hazardous materials testing by all authorities having jurisdiction, to perform testing of soils to be disturbed as required by the Work of the Contract Documents and as may be required by any Authority Having Jurisdiction over the Project.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
1. Testing/Inspection agency: An NRTL, and NVLAP, or an independent agency with experience and capability to conduct testing and/or inspecting services indicated, as documented according to and complying with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077,

ASTM C1093, and ASTM D3740 as may be applicable; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction; and that is acceptable to authorities having jurisdiction.

a. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
b. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

2. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
3. Laboratory: Authorized to operate in the State in which the Project is located.
4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

A. Mock-ups shall identified either on drawings or within individual product specification sections.

B. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

C. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

D. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings or within Specifications. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

E. Room Mock-ups: Construct room mock-ups as indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.

F. Notify Architect and CMa seven (7) calendar days in advance of dates and times when mock-ups will be constructed.

G. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

H. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

I. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

J. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) calendar days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

K. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

L. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

M. Where possible salvage and recycle the demolished mock-up materials.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.

2. Provide qualified personnel at site. Cooperate with CMa, Architect and Contractors in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify CMa, Architect and Contractors of observed irregularities or non-compliance of Work or products.
6. Perform additional tests and inspections required by CMa or Architect.
7. Attend preinstallation meetings and upon request of the Architect attend progress meetings.
8. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify CMa and Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency through CMa and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by CMa or Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.5 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to attend preinstallation meetings, observe, inspect, and test site conditions, conditions of surfaces and installation of substrates, installation of products, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to report unsatisfactory conditions, and to initiate instructions for repairs when necessary.

B. Submit qualifications of manufacturer's technical representative to Architect 30 days in advance of required observations/services.

1. Manufacturer's technical representative subject to approval of Architect and CMa.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.6 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect and CMa, it is not practical to remove and replace the work, Architect, Owner, and CMa will direct an appropriate remedy or adjust payment.

3.7 REPAIR AND PROTECTION

A. Contractor shall, 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 Contract Document requirements for cutting and patching in Section 01 7000 - Execution and Closeout Requirements.

B. Protect existing adjacent surfaces to remain from damage or deterioration due to testing and inspection procedures or repair required by or as a result of testing and inspection procedures.

END OF SECTION 01 4000

SECTION 01 4216 - DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

E. Provide: To furnish and install.

F. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 4216

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SECTION 01 4219 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.2 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with the reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards when required by Contract Documents.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.

E. Should reference and compliance with two or more standards specified in the Contract Documents establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall include within the Contract Sum and account for in the Contract Time the furnishing and installation of the most stringent requirement, the higher quantity, and the higher quality. The Contractor shall submit a Request for Information to clarify the differing or conflicting requirements prior to initiating the Work of the differing or conflicting requirements.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

END OF SECTION 01 4219

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SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dewatering

B. Temporary utilities.

C. Temporary telecommunications services.

D. Temporary sanitary facilities.

E. Temporary Controls: Barriers, enclosures, and fencing.

F. Security requirements.

G. Vehicular access and parking.

H. Waste removal facilities and services.

I. Project identification sign.

J. Field offices and temporary facilities.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary; For work restrictions and limitations on utility interruptions.

B. Section 01 5213 - Field Offices and Sheds.

1.3 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.4 SUBMITTALS

A. Site Utilization Plan: Each contractor shall provide a site utilization plan coordinated with the provided Site Staging and Logistics Plan showing temporary facilities, temporary utility lines and connections, staging areas, lay-down and storage areas for temporary facilities provided within their contract package.

1. Site Utilization Plan is required to be reviewed and approved by the CMa, Architect, and Owner prior to performing any work onsite.

B. Implementation and Termination Schedule: Within 15 calendar days of date established for commencement of the Work, submit schedule indicating implementation dates of each temporary utility.

1.5 DEWATERING

A. Dewater Facilities and Drains: Comply with requirements of Authority Having Jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties, or endanger permanent Work or temporary facilities.

1.6 TEMPORARY UTILITIES

A. Installation and removal of temporary utilities shall be included within the Contract Sum unless otherwise indicated. Allow other entities engaged in Project to use temporary utilities without cost, including but not limited to, Owner's construction forces, Architect, occupants of Project, testing and inspection personnel, and authorities having jurisdiction.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility prior to use. Obtain required certifications and permits.

C. Conservation
1. 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 of resources and associated fees/costs.

D. Location: Locate utility service and access/use points where they will serve Project adequately and result in minimum interference and maximum efficiency for/with performance of the Work. Relocate and modify facilities as required by/for progress of the Work.

E. Provide each temporary utility ready for use when needed to avoid delay. Do not remove temporary utilities until they are no longer required for construction operations or until permanent utilities are approved for temporary use for construction operations.

F. Where new temporary utility service is required to perform construction operations:
1. Contractor shall be responsible for obtaining temporary service from utility provider. Contractor shall produce and provide all required applications, calculations, drawings, and other required information to obtain temporary service, permits and other regulatory permissions to facilitate the installation of the temporary service.

G. Where new permanent utility service is part of the Work:
1. Contractor may utilize new permanent utility service for construction operations. Contractor shall engage permanent service installer to assume responsibility for operation, maintenance, and protection of the permanent utility service and equipment during it's use as a construction facility before Owner's acceptance, regardless of previously assigned responsibility.

H. Contractor's shall coordinate with utility company and CMa for service interruptions and shut downs required for temporary service connections/disconnections. See Section 01 1000 - Summary.

I. Temporary Electricity
1. Connect to Owner's existing power service. Provide connections and extensions of service as required for construction operations.
   a. Owner shall pay for use charges of existing electrical service including temporary service for construction operations.
   b. Do not disrupt Owner's need for continuous service.
2. Provide temporary electric service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
3. Comply with NECA, NEMA, and UL standards and regulations for temporary electrical service and extensions of existing services for temporary purposes. Install service to comply with NFPA 70.

J. Temporary Water
1. Temporary water service shall consist of portable water tank with gasoline powered engine and pump system providing pressurized water delivery/dispensing.
   a. Portable water tank may be filled utilizing existing Owner designated hose bid.

1.7 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

1.8 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to contractors field office(s), Owners field office(s), and Architects field office(s) at time of project mobilization.

B. Telecommunications services shall include:
1. Internet Connections: Provide secure WiFi wireless connection to internet with access provided to the following; Contractor, Owner, Architect, and CMa

1.9 TEMPORARY SANITARY FACILITIES

A. Provide temporary toilets, hand wash facilities, eye wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

B. Use of permanent toilet facilities is not permitted.

C. Maintain daily in clean and sanitary condition.

D. At end of construction, return facilities to same or better condition as originally found.

1.10 TEMPORARY HEATING, VENTILATION, AND COOLING

A. Provide temporary heating and cooling as required by construction operations for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperature or

high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

B. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying. Maintain dehumidification systems where installed Work requires controlled humidity levels until such time that permanent systems are installed and maintaining required humidity levels.

C. Provide temporary ventilation equipment to maintain clean air for construction operations, and as required within individual Specification Sections.

D. Equipment:
1. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide with MERV 8 filter at each return air grille in system and remove at end of construction and clean HVAC system as required in Section 01 7000 - Execution and Closeout Requirements.
2. Unless Owner authorizes use of permanent HVAC systems, provide vented self contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   a. Use of gasoline burning space heaters, open flames heaters, or salamander-type heating units is prohibited.
3. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

1.11 SECURITY AND PROTECTION

A. Barriers
1. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations.
2. Provide structurally adequate barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building. Design and engineering of barricades shall be responsibility of the Contractor. Provide warning signs and lighting.

B. Provide protection for plants designated to remain. Replace damaged plants.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

D. Traffic Controls
1. Provide traffic controls for construction operations as required by and in compliance with Authority Having Jurisdiction.
2. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
3. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and guide traffic.
4. At approaches to site and on site, install traffic signs and signals at crossroads, detours, parking areas, and elsewhere as required to direct construction and affected public traffic and as required by AHJ.

E. Temporary Fire Protection: Install and maintain temporary fire protection facilities of types to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
   1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections..
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of AHJ
   3. Develop and supervise an overall fire-prevention and -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.
   4. Fire Extinguishers: Provide portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposure.

F. Pest Control: Engage pest-control service to recommend practice to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

1.12 FENCING

A. Work Area Enclosure Fence
   1. Prior to start of construction operations, furnish and install work area enclosure fence around the work areas indicated within the Contract Documents.
      a. Coordinate extent of fencing with Owner, using agency and occupants such that fencing does not interfere with operations of Owner, using agency, or current occupants.

B. Construction: Commercial grade chain link fence.

C. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.
   1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

D. Coordinate emergency response path and egress requirements from site and buildings for Owner's continued operations.

1.13 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.14 VEHICULAR ACCESS AND PARKING

A. Dust Control: Provide dust control treatment that is non-polluting and non-tracking. Re-apply treatment as required to minimize dust to greatest extent possible.

B. Access Roads

1. Minimize, to the greatest extent possible, use of existing onsite streets and driveways for construction traffic. Coordinate access to construction entrance.
2. Contractor shall construct temporary roads and paved areas to facilitate access to the project site, including but not limited to, temporary facilities, parking areas, staging areas, storage areas, and areas of construction operations.
3. Tracked vehicles and equipment are prohibited on paved areas.

C. Parking
1. Construction personnel may, at Owners discretion, be permitted to utilize designated area(s) as indicated by Owner. Overloading of parking areas is prohibited. Access for emergency vehicles shall be maintained at all times.
2. Where onsite parking of construction personnel is permitted, but not adequate, Contractor at contractor's option shall provide off-site parking area or require construction personnel to be responsible for obtaining legal off-site parking.

D. Existing pavements, parking areas, and other improvements.
1. Where portions of existing site, including but not limited to, on-site roads, driveways, or other paved areas are utilized for construction access, construction operations, parking, installation of temporary facilities, or other construction related activities, the Contractor shall be responsible for replacing or repairing existing improvements. Repairs or replacement construction shall be consistent with newly installed construction of assembly or items matching existing assemblies or items.

E. Maintenance.
1. Maintain traffic and parking areas in sound condition free of excavated materials, construction equipment, products, trash/debris, gravel/stone, mud, snow, and ice.
2. Maintain paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

F. Removal, repair.
1. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Repair and complete the Work of the Project.
    a. Where areas are intended for landscape development, remove soil and aggregate fill that does not comply with Contract Document requirements for fill, base, sub-base, and/or soil of landscaped areas. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, as well as other substances that might impair growth of plant materials or lawns.
    b. Repair or replace paving, curbs, sidewalks, and/or other permanent/existing to remain construction affected by the installation or use of temporary roads or paved areas for construction operations.

G. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

H. Coordinate access and haul routes with governing authorities and Owner.

I. Provide and/or maintain access to fire hydrants and control valves, free of obstructions.

J. Provide means of removing mud and debris from vehicles and wheels before entering streets.

1.15 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.16 PROJECT SIGNS

A. Project Information and Direction
1. Signs shall be standard products or custom signs capable of withstanding environmental conditions, including but not limited to, weathering, sun exposure, and wind exposure. Lettering and directional graphics shall be visible and legible at 100 foot distance.
2. Provide information signs at each field office.
3. Provide directional signs to direct traffic to project entrance and to direct traffic within Project site.
4. Provide municipal traffic agency directional traffic signs as required by Authority Having Jurisdiction.
5. Maintain signs to be visible and legible at all times. Replace signs that are missing or become damaged and illegible.
6. Provide signs directing occupants to temporary egress locations/exits. Signs shall be as required by Authority Having Jurisdiction.

1.17 FIELD OFFICES AND TEMPORARY FACILITIES - SEE SECTION 01 5213

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 5000

SECTION 01 5213 - FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary field offices for use by entities involved with the project; Common Use Field Office.

B. Temporary field offices for Project operations for use of CMa; Administrative Office(s) .

C. Temporary field offices for use of Contractor.

D. Maintenance and removal.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: use of premises and responsibility for providing field offices.

B. Section 01 5000 - Temporary Facilities and Controls:
1. Temporary telecommunications services for administrative purposes.
2. Temporary sanitary facilities required by law.

1.3 USE OF EXISTING FACILITIES

A. Existing facilities shall not be used.

1.4 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.1 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

A. Portable or mobile buildings, securely fixed to foundations, with steps and landings at entrance doors.
1. Where required by authorities having jurisdiction, provide accessible access to temporary facilities, including but not limited to, ramps, guard rails, handrails, and landings.
   a. Configuration of access deck/landing and associated components shall be as indicated within the drawings.

B. Construction: Structurally sound, secure, weather tight enclosures. Maintain during progress of Work; remove prior to Substantial Completion, as directed by Owner or Architect, or after field offices are transitioned to location within permanent facilities; Obtain Owner's permission in writing prior to moving offices.

C. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.

D. Fire Extinguishers: Appropriate type fire extinguisher at each office.

E. Permitting: Contractor shall be responsible for obtaining permits for temporary facilities. This Work shall include the production of and provision for any/all documents required.

2.3 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain 68 degrees F heating and 76 degrees F cooling.

2.4 COMMON USE FIELD OFFICE

A. The Common Use Field Office may be combined with Contactor's Office and other administrative offices in a single portable or mobile unit; Each work space and meeting space must be separated by partitions and be equipped with doors. Contractor's Office and Administrative Office(s) shall comply with requirements as indicated within each following Article respectively.

B. Furnishings in Meeting Area: Conference table and chairs to seat at least ten persons; racks and files for Contract Documents, submittals, and project record documents

C. Drinking Water dispenser and disposable cups.

2.5 CONTRACTOR OFFICE AND FACILITIES

A. Size: For Contractor's needs.

B. Other Furnishings: Contractor's option.

C. Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer .

2.6 ADMINISTRATIVE OFFICE(S)

A. Provide a separate administrative office for the CMa.

B. Separate space for each of the administrator(s) indicated, with separate entrance door; with new lock and two keys per door.

C. Area: Each at least 150 sq ft, with minimum dimension of 8 ft.

D. Windows: At least one, with minimum total area equivalent to 10 percent of floor area, with an operable sash and insect screen. Locate to provide views of construction area.

E. Electrical Distribution Panel for Each: Two circuits minimum, 110 volt, 60 hz service.

F. Minimum each office, four 110 volt duplex convenience outlets, one on each wall.

G. Furnishings: Provided by Contractor.
1. One desk 54 by 30 inch, with three drawers.
2. Plan rack to hold working drawings, shop drawings, and record documents.
3. One standard four-drawer legal size metal filling cabinet with locks and two keys per lock.
4. One task chair(s) with arms.
5. One tackboard 36 by 30 inch.
6. One waste basket per desk and table.

2.7 STORAGE AND FABRICATION SHEDS

A. Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

B. Storage of combustible materials shall be separated from the building by a minimum of 30 feet.

PART 3 EXECUTION

3.1 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.2 INSTALLATION

A. Install office spaces ready for occupancy 15 business days after date fixed in Notice to Proceed.

B. Employee Residential Occupancy: Not allowed on Owner's property.

3.3 MAINTENANCE AND CLEANING

A. Maintain facilities in good operating condition until removal.

B. Weekly janitorial services for offices; periodic cleaning and maintenance for offices. Owner shall provide janitorial services for Owner/Using Agency temporary facilities.

C. Maintain approach walks free of mud, water, and snow.

3.4 TERMINATION AND REMOVAL

A. Remove each temporary facility and associated foundations, utility services, and debris, when need for its service has ended, when it has been replaced by authorized use of permanent facilities, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been affected by and/or delayed because of interference with a temporary facility. Repair damaged Work or construction to remain, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

B. Materials and facilities that constitute temporary facilities are the property of the Contractor.

C. Prior to Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7000 - Execution and Closeout Requirements.

END OF SECTION 01 5213

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Identification of Owner-supplied products.

B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 4000 - Quality Requirements: Product quality monitoring.

D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.3 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators.

B. NFPA 70 - National Electrical Code.

1.4 DEFINITIONS

A. Products: Items for incorporating into the Work, whether purchasaed for Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make and/or model number/name or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been purchased for or incorporated into another project or facility and purchased from a product supplier, distributor, or manufacturer specifically for this Project. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated by manufacturers literature, product data, and testing results/reports/certifications to meet or exceed the minimum characteristics of Named Products and/or listed minimum requirements of the Contract Documents. Minimum Charactersitics of products include but are not limited to, function, dimensions, in-service performance, physical properties, appearance, options (including color selection), and usability. The Owner and Architect have final determination whether or not a product meets or exceeds the minimum characteristics of the Named Product(s) and/or listed minimum requirements of the Contract Documents.
4. Basis of Design Product: Singular Named Product that establishes the significant minimum requirements of a product. Minimum requirements of a Basis of Design Product may be supplemented with additional requirements listed within the Contract Documents. Basis of Design Products are not intended to limit procurement of products to the Named Product unless noted within the product specification with "No Substitutions Allowed" or verbiage of similar intent. Comparable Products submitted for compliance with the product specification indicating a Basis of Design Product shall be reviewed against the characteristics of the Basis of Design Product and supplemental requirements listed within the specification. Basis of Design Products may also be products in which the specific characteristics of the Named Product were utilized in the design and engineering of the Project. Selection of Comparable Products in these cases may require Delegated Design Services or redesign at the expense of the Contractor.

1.5 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. Show coordination with adjacent products, accessories, and other construction. See Section 01 3000 - Administrative Requirements.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.6 PRODUCT WARRANTIES

A. Warranties specified in individual product specifications 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 the Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project specific information and properly executed.
   2. Specified Form: When specified forms are included with, appended to, or reference by the individual Specification Sections, prepare the written document using the indicated/provided form properly completed and executed.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. When individual Specification Sections indicate a Named Product or a list of Named Products, Contractor shall provide the Named Product or one of the Named Products unless specification section Article indicates other Comparable Products may be provided. Other Comparable Products shall be required to meet the minimum requirements and characteristics of the Named Product(s) along with any other listed requirements within the individual specification section.
   1. Where individual specification sections allow Comparable Products and those Comparable Products meet the minimum requirements of the Named Product and other requirements of the Section, the Contractor will not be required to comply with the Substitution Procedures of Section 01 2500 - Substitution Procedures. If the product does not meet all of the minimum requirements it shall be considered a substitution and the Contractor will be required to follow the Substitution Procedures of Section 01 2500 - Substitution Procedures.
   2. Where the phrase "No Substitutions Allowed" or "Provide one of the following" or verbiage of similar intent is indicated, the Contractor shall provide the Named Product or one of the Named Products only.

B. Where individual Specification Sections provide performance requirements, specific requirements, specific characteristics, or other requirements without providing manufacturer's names or Named Products, Contractor shall provide products complying with or outperforming the requirements indicated. Products not meeting all the requirements listed shall be required to comply with the substitution procedures of Section 01 2500 - Substitution Procedures.

2.2 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

2.3 NEW PRODUCTS

A. Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, fasteners, finish, and other items needed for a complete installation and intended use and effect.

B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:

1. Made outside the United States, its territories, Canada, or Mexico.
2. Made using or containing CFC's or HCFC's.
3. Made of wood from newly cut old growth timber.
4. Containing lead, cadmium, or asbestos.

D. Provide interchangeable components by the same manufacture for components being replaced.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.2 OWNER-SUPPLIED PRODUCTS

A. See Section 01 1000 - Summary for identification of Owner-supplied products.

3.3 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas and other Project structures.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Do not store products directly on the ground.

K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

L. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

M. Prevent contact with material that may cause corrosion, discoloration, or staining.

N. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

O. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 6000

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SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including requirements for selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 7123 - Field Engineering: Additional requirements for field engineering and surveying work.

E. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

F. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

G. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

H. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

2. Limitations on cutting structural members.

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, telephone number, and qualifications of Surveyor before starting survey work.
1. On request, submit documentation verifying accuracy of survey work.
2. Submit a copy of site drawing and certificate signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
3. Submit surveys and survey logs for the project record.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.5 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to CMa and Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.6 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
   3. Provide dust control treatment in areas of bare soil that is non-polluting and non-tracking. Re-apply treatment as required to minimize dust to greatest extent possible.

G. Erosion and Sediment Control (SEC): Comply with approved sediment and erosion control plans. Where SEC plans are not part of the Contract Documents, plan and execute sediment and erosion control work to comply with authorities having jurisdiction by methods approved by the AHJ to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.7 COORDINATION

A. See Section 01 1000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new 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.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

I. Cutting and Patching Conference: Prior to proceeding with cutting and patching operations, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades, and

original installer where possible. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
   1. 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.
      a. If identical materials are unavailable or cannot be used, use materials that, when installed, provide a match acceptable to Architect for the visual and functional performance of in-place materials.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions, Utilities
   1. Existence and location of underground and other utilities indicated within drawings is not guaranteed.
   2. Prior to beginning site work, investigate and verify the existence and location of underground utilities (underground or otherwise), mechanical and electrical systems, and other construction affecting the Work.
      a. Verify the location and invert elevations at points of connection of sanitary sewer, and water-service piping; underground electrical services, and other utilities.
      b. Furnish location data work related to Project that must be performed by public utilities serving Project site.
   3. Verify that utility services are available, of the correct characteristics, and in the correct locations.

B. Existing Conditions
   1. Prior to proceeding with each component of the Work, examine areas, substrates, surfaces, supporting structure(s), and other conditions that may affect the installation of the next components, products and/or assemblies. Examine with Installer(s) and Applicator(s) present of both installed Work and Work to be installed, for compliance with requirements for installation, including but not limited to, tolerances and surface preparation and adequacy.
   2. Examine and verify specific conditions described in individual specification sections.
   3. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication
   4. Examine rough-in for mechanical plumbing and electrical .

5. Record observations, comments, acceptance or non-compliance, and corrective actions to be taken where necessary.
6. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility components ro systems in or affected by construction. Coordinate with authorities having jurisdiction.

B. 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.

C. Clean substrate surfaces prior to applying next material or substance.

D. Seal cracks or openings of substrate prior to applying next material or substance.

E. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS; SEE 01 3000 - ADMINISTRATIVE REQUIREMENTS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

3.4 LAYING OUT THE WORK

A. Prior to proceeding with laying out the Work, verify information provided within the Contract Documents, in relation to the property survey and control points. Promptly notify Architect of any discrepancies discovered.

B. Engage a land surveyor to lay out the Work using accepted surveying practices.

C. Establish (locate) benchmarks, control points, and reference points to set lines and levels at each story of construction and elsewhere as required to locate each element of the Project.
1. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
2. Inform installers of lines and levels to which they must comply.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
1. Promptly report to CMa the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
2. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to CMa.

E. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.
      a. Level foundations and piers from two or more locations.
   4. Controlling lines and levels required for mechanical and electrical trades.

F. Periodically verify layouts by same means.

G. Maintain a complete and accurate log of control and survey work as it progresses.
   1. Record deviations from required lines and levels.
   2. Include beginning and ending dates and times of surveys, weather conditions, name and duty fo each survey party member, and types of instruments and tapes used.

H. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   3. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

C. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

H. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

I. Conduct construction operations so no part of Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

J. Sequence the Work and allow adequate clearance to accommodate movement of construction items on site and placement in

K. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

L. 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 and Coordination Drawings to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

M. 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 align with other portions of the Work. Where size and type of attachment is 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 installation anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, tat are to be embedded in concrete and masonry. Deliver such items to Project site in time for installation.

N. 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.

3.6 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting and/or patching.

B. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and restore surfaces without delay. Restoration of surfaces shall include, but is not limited to, preparing the surface to receive new Work and restoring the surface to match original condition/match adjacent surfaces.

C. Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: Shore, brace, and support structural elements 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 operational 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 decrease 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 buildings' aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
5. Temporary Support: Provide temporary support of work to be cut and patched.
    a. Shoring, bracing, and support elements and procedures are the responsibility of the contractor, including but not limited to design, installation, maintenance, safety, removal, and corrective actions to repair attachment/contact points with the Work.

D. Perform minimum amount possible of cutting and patching as necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

G. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods, with materials, and in a manner acceptable to warranting entity to maintain the existing warranty of the products and assemblies effected by the cutting and patching operations.

H. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, or other similar operation, using methods least likely to damage elements retained or adjoining construction.
   1. In general, use hand or small power tools designed far sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimize size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut drill from exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as abrasive saw or a diamond core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting. See applicable other Sections that may contain additional or more stringent requirements.

I. Restore work with new products in accordance with requirements of Contract Documents.

J. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

K. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8413, to full thickness of the penetrated element.

L. Patching:
   1. Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and perform the Work to comply with installation requirements of other Sections for both the patching materials as well as the any materials to be installed onto patching materials.
      a. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation and compliance with other Work.

2. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
3. Match color, texture, and appearance.
4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.7 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
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 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 requirements of AHJ.

E. Installed Work:
1. 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 or methods are not recommended, use cleaning materials that are not hazardous to health property and that will not damage exposed surfaces.
2. 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.

3.8 PROTECTION OF INSTALLED WORK

A. See Section 01 7610 for temporary protective covering materials.

B. Limit Exposures: Supervise construction ope7rations to assure that no part of the construction, complete or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

C. Protect installed work from damage by construction operations.

D. Provide special protection where specified in individual specification sections.

E. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

F. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

G. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

H. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

I. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

J. Prohibit traffic from landscaped areas.

K. Prohibit hydraulic equipment from accessing areas with finished surfaces or surfaces that are to receive a clear, transparent, or translucent coating/covering. Where hydraulic equipment is needed to access areas with such surfaces, protect surfaces from spilled hydraulic fluid. Surfaces stained by hydraulic fluid will be removed and replaced in their entirety to provide consistent finish.

L. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.9 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify CMa and Architect seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION; SEE 01 7900 - DEMONSTRATION AND TRAINING

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.

1. Conduct cleaning and waste removal operations to comply with local laws and ordinances and federal and local environmental and antipollution regulations.

B. Employ experienced professional cleaners for final cleaning.

C. Use cleaning materials that are recommended by manufacturer or fabricator of the surface or equipment to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

D. Clean interior and exterior glass surfaces, including mirrors, exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.

E. Clean interior and exterior hard surface finishes to a dirt free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces where intended to remain. Restore reflective surfaces to their original condition.

F. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

G. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

H. Clean plumbing equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

I. Clean debris and dust from limited access spaces including but not limited to, plenums, shafts, equipment vaults, manholes, attics, and similar spaces.

J. Clean debris and dust from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

K. Clean mechanical equipment and fixtures; wipe surfaces.
1. Clean permanent filters and replace disposable filters of operating equipment.
2. Clean exposed surfaces of diffusers, registers, and grilles.
3. Clean ducts, blowers, coils and similar items.
4. Remove excess lubrication and other foreign substances.

L. Clean electrical equipment and fixtures; wipe surface.
1. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

M. Clean Project site.
1. Clean site, yards, and grounds, in areas disturbed by construction activities, including landscape developed areas, of rubbish, waste materials, litter, and other foreign substances.
2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Rake grounds that are neither planted nor paved to smooth, even textured surface.
4. Remove tools construction equipment, machinery, and surplus material form Project site.
5. Remove snow and ice to provide safe access to building.

N. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Project Closeout Conference: CMa will schedule and conduct a project closeout conference at a time convenient to the CMa, Owner and Architect, but not later than ninety (90) calendar days prior to the scheduled date of Substantial Completion of the final phase.
   1. Attendees: Owner, CMa, Architect, and their consultants; Prime Contractors superintendent, major subcontractors, suppliers, and other concerned parties shall attend the meeting.
   2. Agenda: Discuss items of significance that could affect or delay final closeout, including the following:
      a. Preparation of record documents.
      b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
      c. Submittal of written warranties.
      d. Requirements for preparing operations and maintenance data.
      e. Requirements for delivery of material samples, attic stock, and spare parts.
      f. Requirements for demonstration and training.
      g. Preparation of Contractor's Punchlist.
      h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
      i. Submittal procedures.
      j. Coordination of separate contracts.
      k. Owners partial occupancy requirements.
      l. Installation of Owner's furniture, fixtures, and equipment.
      m. Removal of temporary facilities and controls.
   3. Minutes: CMa will record and distribute the meeting minutes.

B. Make submittals that are required by governing or other authorities.
   1. Provide copies to CMa and Architect.
   2. Provide copies to Owner.

C. Closeout Inspections Prior to Substantial Completion
   1. Contractor's Correction Punch List
      a. Contractor is required to perform a preliminary inspection to determine and record items to be completed or corrected prior to CMa and Architect's inspection. Record of items to be completed and corrected shall be the Contractor's Correction Punch List and shall include a comprehensive list of items to be completed and/or corrected along with an estimated timeline in which all items on the list shall be resolved.
         1) Notify CMa and Architect a minimum of 10 days prior to the date the Contractor wishes the Architect's Substantial Completion Inspection be performed and only when work is considered ready for Architect's Substantial Completion Inspection. Along with notification, submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion Inspection.
            a) Contractor may request Architect's Substantial Completion Inspection prior to resolving all items on the Contractor's Correction Punch List. Contractor must include with the request an updated Contractor's Correction Punch List indicating resolved items and incomplete items. Incomplete items shall be listed with value (cost) of incomplete item and explanation of why the work is not complete/resolved. Architect will determine if the

Architect's Substantial Completion Inspection will be conducted or delayed pending resolution of additional Contractor's Corrective Punch List items.

b. Organization of Contractor's Correction Punch List
   1) Include name and identification of each space and area included within the work area or affected by the Work or where Work was performed and the items that are incomplete or require correction within those areas.
   2) Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest to highest floor.
   3) Organize items applying to each area by major element, including categories for ceiling, individual walls, floors, equipment, and building system.

2. Architect's Substantial Completion Inspection
   a. Upon receipt of notification of the completion of the Contractor's Correction Punch List, Architect will either proceed with the inspection or notify the Contractor of unfulfilled requirements.
   b. Upon acceptance of the Contractor's Correction Punch List, the Architect will perform the Architect's Substantial Completion Inspection. Architect will prepare the Certificate of Substantial Completion or will notify the Contractor of items, either on contractor's list or additional items identified by Architect, that must be complete or corrected prior to the issuance of a Certificate of Substantial Completion.
      1) Where items are required to be completed or corrected, the Contractor will notify the Architect that the identified items have been resolved and request a re-inspection.
      2) Results of completed Architect's Substantial Completion Inspection shall be the basis of requirements for Final Completion.

D. Procedures Prior to Substantial Completion
   1. Complete the following items 10 days prior to the date the Contractor wishes the Architect's Substantial Completion Inspection be performed:
      a. Advise Owner in writing of pending insurance changeover requirements.
      b. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
      c. Complete startup and testing of systems and equipment.
      d. Perform preventative maintenance on equipment used prior to Substantial Completion.
      e. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training media specified in Section 01 7900 - Demonstration and Training.
      f. Advise Owner of changeover of utilities.
      g. Complete termination and removal of temporary facilities remaining.
      h. Complete final cleaning requirements/procedures.
   2. Submit the following items 10 days prior to the date the Contractor wishes the Architect's Substantial Completion Inspection be performed:
      a. Certificate of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities.
      b. Closeout submittals specified in other Divisions including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information. See Section 01 7800 - Closeout Submittals for additional information.

c. Maintenance Materials: Provide maintenance material submittals specified in individual Section, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect or Owner.
d. Submit testing, adjusting, and balancing records.
e. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

E. Final Completion Procedures
1. Procedures Prior to Final Completion
a. Prior to requesting Final Completion Inspection, complete the following:
1) Submit Final Application for Payment; See Section 01 2000 - Price and Payment Procedures.
2) Submit certified list of incomplete items: Submit a certified copy of Architect's Substantial Completion Inspection list of items to be completed or corrected endorsed and dated by Contractor stating each item has been completed or otherwise resolved for acceptance.
3) Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4) Submit pest-control final inspection report.
2. Final Completion Inspection
a. Submit a written request for Final Completion Inspection, to determine acceptance, a minimum of 10 days prior to the date the Work will be complete and ready for Final Completion Inspection. Upon receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate of Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1) Where items are required to be completed or corrected, the Contractor will notify the Architect that the identified items have been resolved and request a re-inspection.

F. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than two years from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 7000

SECTION 01 7123 - FIELD ENGINEERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field engineering services by Contractor.

B. Land surveying services by Contractor.

C. Boundary demarcations.

D. Construction surveying by Contractor.

E. Support and bracing.

F. Remote Project Observation; Streaming,Still, and Time-Lapse Photography.

1.2 RELATED REQUIREMENTS

1.3 DESCRIPTION OF SERVICES

A. **Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements or Administrative Requirements.**
   1. **See 01 3000 - Administrative Requirements.**
   2. **See 01 7000 - Execution and Closeout Requirements**

B. Contractor:
   1. Has sole responsibility for establishing all locations, dimensions and levels of items of work as intended by and within tolerances of the Contract Documents.
   2. Has sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure, and pipeline elevation stakes, and other items.
   3. Required to have a skilled instrument person(s) available on short notice when necessary for laying out the work.
   4. Must keep a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.
   5. Shall provide facilities and assistance necessary for CMa and Architect to check lines and grade points placed by Contractor.
      a. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by CMa and Architect.
   6. Must prepare and maintain daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to CMa and Architect.

7. Must prepare and maintain professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.
8. Prior to backfilling operations, Contract is required to surveying - locating, and recording on a copy of Contract Documents - an accurate representation of buried work and Underground Facilities encountered.
9. Must set up and execute time-lapse photography of construction activities.

1.4 REFERENCE STANDARDS

A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology.

B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks.

C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement.

D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems.

E. State Plane Coordinate System for the State in which the Project is located.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Inform Architect and CMa 7 calendar days prior to the start of the work of this section; Architect will determine if Preinstallation Meeting shall be conducted; All affected installers shall be required to attend a Preinstallation Meeting.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit in addition to items required in Section 01 7000 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:
1. Field Engineering: Submit daily reports, with content as indicated in this section.
    a. When requested by CMa or Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor’s survey notes and field notes.
2. Final property survey.

1.7 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 01 7000 - Execution and Closeout Requirements.

B. Land Surveyor's Qualifications: As established in Section 01 7000 - Execution and Closeout Requirements.

C. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

D. Minimum accuracy for required work is as follows:
   1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
   2. Culverts and ditches: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
   3. Structures: Horizontal Tolerance: Plus or minus 0.5 feet (location), Vertical Tolerance: Plus or minus 0.05 feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to proceeding with laying out the Work, verify information provided within the Contract Documents, in relation to the property survey and control points. Promptly notify Architect of any discrepancies discovered.

B. Locate and protect existing benchmarks, base lines, and demarcations. Preserve permanent reference points during construction.

C. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.2 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise CMa, Architect and Owner of all discrepancies of which Contractor is aware.

E. Cooperate as required with CMa, Architect and Owner in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

G. In general, match existing adjacent grades and maintain existing flow lines.

H. Check the location, line and grade of every major element as the work progresses. Notify the CMa and Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without Owner’s concurrence of the remediation plan.

I. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with shop drawings and Contract Documents requirements.

J. Check all bracing and shoring for structural integrity and compliance with designs prepared by the Contractor.

3.3 LAND SURVEYING

A. General: Follow standards for geospatial positioning accuracy.
1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.
2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.

B. Coordinate survey data with the State Plane Coordinate System of the State in which the Project is located.

C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in the State in which the Project is located, and approved by the CMa and Architect.
1. Temporarily suspend work at such points and for such reasonable times as may be required for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.4 BOUNDARY DEMARCATIONS

A. Wetlands: Protect demarcations and areas from disturbance as indicated on drawings.

B. Species Habitat: Protect demarcations and areas from disturbance as indicated on drawings.

C. Historic Archaeology: Protect demarcations and areas from disturbance as indicated on drawings.

D. Undisturbed: Protect demarcations and areas from disturbance as indicated on drawings.

3.5 CONSTRUCTION SURVEYING

A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.
3. Structure: Stake out structures, including elevations, and check prior to and during construction.
4. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.
5. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
6. Road: Stake out roadway elevations at 50 foot intervals on tangent, and at 25 foot intervals on curves.
7. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
8. Easement Staking: Provide easement staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. If required by project conditions, provide wooden laths with flagging at 100 foot intervals.
9. Record Staking: Provide permanent stake at each blind flange and each utility cap provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.

10. Structural Frame: Upon completion, certify location and plumbness.

B. Surveying to Determine Quantities for Payment.
1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of work performed or placed. Perform surveys necessary for Architect to determine final quantities of work in place.
2. Notify CMa at least 24 hours before performing survey services for determining quantities. Unless waived in writing by CMa, perform quantity surveys in presence of CMa.

C. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

D. Use by the CMa or Architect: The CMa or Architect may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the work and may be checked by the CMa or Architect at any time.

E. Accuracy:
1. Establish Contractor's temporary survey references points for Contractor's use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
   a. Horizontal Accuracy of Easement Staking: Plus/minus 0.1 foot.
   b. Accuracy of Other Staking: Plus/minus 0.04 foot horizontally and plus/minus 0.02 foot vertically.
   c. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
2. Owner reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.6 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, where required to complete the Work. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not over stress the building structure or other supporting materials or assemblies.

3.7 REMOTE PROJECT OBSERVATION; STREAMING, STILL, AND TIME-LAPSE PHOTOGRAPHY

A. Provide two (2) streaming observation point(s) to record entire construction project; General location of observation point(s) shall be determined by Architect during the Preconstruction Meeting; Contractor shall locate observation point(s) in general area determined by Architect; Observation point(s) shall be located to not interfere with the progress of the Work; shall be placed to provide unobstructed view; shall not be relocated unless approved by Architect.
1. Fixed point Camera: Provide one (1) stationary, fixed point streaming/time lapse camera(s).
2. PTZ Camera: Provide one (1) streaming pan, tilt, zoom camera(s).

B. Camera and Accessories
1. Weatherproof; suitable for weather conditions (precipitation and temperature) of Project location.
2. Capable of producing 12 megapixel images minimum.

3. Provide camera(s) and associated equipment/software that record at one frame per second rate, or as approved by Architect. Resulting time-lapse will be viewed at standard 25 frames-per-second speed.
4. Provide, configure, and set pole, mounting accessories, power supply, solar power station, active high speed data connection,static public IP address, and other accessories and services as required for intended use and operation of/for each camera.
5. Fixed Point Camera:
   a. Camera is required to provide a field of view of the entire project area.
6. PT
   a. Remotely controllable with mouse click user navigation of horizontal pan, vertical tilt, and optical zoom of 500 percent minimum.

C. Web Based Interface: Provide on-line interface to allow viewing of real time streaming video, time-lapse video, and each high-definition digital image captured and stored during construction.
1. Access Control: Provide password protected access for Project team administered by Contractor; Providing permissions and access to control PTZ cameras where provided, view real time streaming video, and view and download time lapse videos and current and archive images by date and time.
2. Software: Provide responsive software interface for use on computer, tablet, and mobile devices; Apps shall be available for tablets and mobile devices; iOS and Android.
3. Storage: Maintain images and videos on website for reference and download during entire construction period and not less than 60 days after Final Completion. Provide sufficient memory on remote server to store all Project images and videos.
4. Forward and Reverse: Provide capability to browse through images, moving forward and backward in time by individual image and by day.
5. Tile Display/Dashboard: Provide capability to automatically display current images/live streaming from multiple cameras.
6. Weather: Provide corresponding weather data for each image captured.

D. Maintain cameras, web-based interface, data connections, and associated equipment in good working order. Comply with manufacturers or service providers written instructions.

E. Submit to the CMa, Owner and Architect a USB based mobile storage device compatible with the current operating systems of CMa, Owner and Architect of entire digital time-lapse photography record, and every high-definition image captured during construction period at the conclusion of the project.

3.8 REPORTS

A. Post Contractor’s daily reports to web-based project software service by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor’s staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.9 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in

Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.

2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

B. Submit three copies of final property survey to Owner. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:
   1. Structure locations from property lines, and distances to adjacent buildings.
   2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
   3. Location of easements.
   4. Final grading topographic survey.

3.10 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

END OF SECTION 01 7123

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SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling and Salvage: The following may not be disposed of in landfills or by incineration. Items may be reused in Project only when specifically identified to be reused.

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Clean dimensional wood.
5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing for use options.
6. Concrete: Pulverize to maximum 4-inch size; prepare to reuse on site where indicated or transport off-site to be re-used by others.
7. Bricks: If indicated within Contract Documents, reuse whole bricks. If indicated within Contract Documents pulverize to maximum size indicated and utilize as indicated for re-use. Where not indicated for reuse on Project, stack whole pieces and package for shipping; pulverize partial pieces to maximum 4-inch size and transport off-s : May be used on project if indicated and if whole, otherwise transport off-site to be reused by other; Pulverize partial pieces or crushed and used as landscape cover, sub-base material, or fill.
8. Concrete masonry units: If indicated within Contract Documents, reuse whole units. If indicated within Contract Documents pulverize to maximum size indicated and utilize as indicated for re-use. Where not indicated for reuse on Project, stack whole units and package for shipping; pulverize partial units to maximum 4-inch size and transport off-site to be re-used by others.
9. Asphalt paving: May be recycled into paving for project : Break up and transport to ashpalt recycling facility.
10. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
11. Glass.
12. Plastic buckets.
13. Paint.
14. Plastic sheeting.
15. Rigid foam insulation.

E. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

F. Develop and follow a Waste Management Plan designed to implement these requirements.

G. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
2. Burying on the project site.
3. Illegal dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.

B. Section 01 2500 - Substitution Procedures.

C. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

D. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

E. Section 01 6000 - Product Requirements: Waste prevention requirements related to product substitutions.

F. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

G. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

H. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and seubsequent sale, recylcing, reuse, or deposit in landfill or incinerator acceptable ot authorities having jurisdiction.

D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

E. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

F. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

H. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

I. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

J. Return: To give back reusable items or unused products to vendors for credit.

K. Reuse: To reuse a construction waste material in some manner on the project site.

L. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

M. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

N. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

O. Toxic: Poisonous to humans either immediately or after a long period of exposure.

P. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

Q. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Submit Waste Management Plan within 21 calendar days after execution of the Owner-Contractor Agreement; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

C. Waste Management Plan: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
      a. List each material proposed to be salvaged, reused, or recycled.

1) For materials to be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
   b. List the local market for each material.
   c. State the estimated net cost, versus landfill disposal.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

E. Recycling Incentive Programs:
1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.

2. Where revenue accrues to Owner, submit any additional documentation required by Owner in addition to information provided in periodic Waste Disposal Report.

PART 2 PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. See Section 01 6000 and Section 01 2500.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
1. Relative amount of waste produced, compared to specified product.
2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
3. Proposed disposal method for waste product.
4. Markets for recycled waste product.

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01 1000 for list of items to be salvaged from the existing building for relocation in project or for Owner.

B. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

D. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

E. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an onsite person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide onsite instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
1. Prebid meeting.
2. Preconstruction meeting.

3. Regular job-site meetings.
4. Job safety meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
1. As a minimum, provide:
   a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
   b. Separate dumpsters for each category of recyclable.
   c. Recycling bins at worker lunch area.
2. Provide containers as required.
3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
5. Locate enclosures out of the way of construction traffic.
6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 7419

SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Materials transparency manual.

D. Warranties and bonds.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Architect prior to Substantial Completion Inspection.
1. Record Drawings:
    a. Initial Submittal: Submit PDF electronic file of scanned record drawings.
        1) PDF files shall be a single file of all drawings. Drawings shall be labeled with sheet number and bookmarked.
    b. Final Submittal:
        1) Submit PDF electronic files of scanned record drawings incorporating comments and corrections made during Initial Submittal.
            a) PDF files shall be a single file of all drawings. Drawings shall be labeled with sheet number and bookmarked.
        2) Submit one set of printed drawings.
2. Record Product Data:
    a. Submit PDF annotated PDF electronic files and directories of each submittal.
    b. Where Record Product Data is required as part of the Operation and Maintenance Manual, submit duplicate marked up Record Product Data as a component of the maintenance manual.
3. Miscellaneous Record Submittals: See other Sections for record keeping requirements and submittals in connection with various construction activities. Submit annoted PDF electronic files and directories of each submittal.

B. Operation and Maintenance Data:
   1. Submit PDF electronic file. Assemble manual into a composite electronically indexed (book marked) file.
      a. Preliminary Submission: Submit preliminary draft of format and outlines of content 30 days prior to commencement of demonstration and training. Architect will review preliminary draft and return copy with comments.
      b. Initial Submission: Submit draft copy of manual(s) 15 days prior to final inspection. Architect will review and return after final inspection, with Architect's comments. Revise content of all documents as required for final submission.
      c. Final Submission: Submit manual(s) in final form 15 days after receipt of Architect's comments of Initial Submission.
      d. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.
   1. Mark to show the actual installation where installation varies from that shown originally.
   2. Give particular attention to information of concealed elements that would be difficult to identify or measure and record at a later time. verify mark-ups before enclosing concealed installations.
   3. Record data as soon as possible after obtaining.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
      a. Revisions to routing of piping and conduits.
      b. Duct size and routing.
      c. Equipment locations.
      d. Revisions to electrical circuitry.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.
   6. Note identifying numbers of Architects Supplemental Instructions (ASI), Change Directives, Change Orders, construction sketches, and other modification documents.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts. Cross-reference specification section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.

3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owners operating personnel for notification of installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.5 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
   a. Product name and model number.
   b. Manufacturer's name.
   c. Equipment identification with serial number of each component.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
   a. Performance and design criteria if Contractor has delegated design responsibility.
4. Complete nomenclature and model number of replaceable parts.

5. License requirements including inspection and renewal dates.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Include piped system diagrams.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
1. Include HVAC outdoor and exhaust air damper calibration strategy.
    a. Include provisions which ensure that full closure of dampers can be achieved.
2. Include Carbon Dioxide Monitoring Protocol.
3. Include Carbon Monoxide Monitoring Protocol.
4. Include Frost Mitigation Strategy for ventilation heat-recovery system.

H. Provide servicing and lubrication schedule, and list of lubricants required.

I. Include manufacturer's printed operation and maintenance instructions.

J. Include sequence of operation by controls manufacturer.

K. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

L. Provide control diagrams by controls manufacturer as installed.

M. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

N. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

O. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

P. Include test and balancing reports.

Q. Additional Requirements: As specified in individual product specification sections.

3.6 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Directory:

1. Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
   a. List of Documents
   b. List of Systems
   c. List of Equipment
   d. Table of Contents.
2. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
3. List of Equipment: List of equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
4. Table of Contents: Include a table of contents for each emergency, operation and maintenance manual.

B. Organize operations and maintenance manuals following the example template appended to this document following this Section.

C. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

D. Where systems involve more than one specification section, provide separate tabbed divider for each system.

E. Manuals, Physical
1. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
2. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
3. Project Directory: Title and address of Project; names, addresses, and telephone numbers of CMa, Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
4. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
5. Dividers/Separation Pages: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
6. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
7. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. O&M Manual, Electronic: Combine PDF files of Cover, Project Directory, Table of Contents, and Separation Pages, Text/Copy/Data, and Drawings. Organize pdf in same manner as physical manual and bookmark each item.
1. Scan original physical documents to be included in the electronic manual where electronic versions do not exist. Document data size shall be reduced to smallest file size without data loss or reduction in legibility.

G. Arrangement of Contents: Organize each volume in parts as follows:

1. Project Directory.
2. Table of Contents, of all volumes, and of this volume.
3. Operation and Maintenance Data: Arranged by system, then by product category.
   a. Source data.
   b. Product data, shop drawings, and other submittals.
   c. Operation and maintenance data.
   d. Field quality control data.
   e. Photocopies of warranties and bonds.
4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.7 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

F. Warranty Manual, Physical: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
   1. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
   2. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
   3. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

G. Warranty Manual, Electronic: Combine PDF files of Cover, Table of Contents, and Separation Pages, and Warranties and Bonds. Organize pdf in same manner as physical manual and bookmark each warranty and bond.
   1. Scan original warranties and bonds to be included in the electronic manual.

END OF SECTION 01 7800

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INSERT OWNER LOGO HERE

IF OWNER DOES NOT HAVE LOGO,

INSERT COMPLETED PROJECT PHOTO OF ENTRY FAÇADE

OPERATION & MAINTENANCE MANUAL VOLUME {#}

{PROJECT NAME}

{PROJECT ADDRESS LINE 1}

{PROJECT ADDRESS LINE 2}

DATE OF SUBSTANTIAL COMPLETION

{January 1, 0000}

Contractor: {Company Name}

{Point of Contract Name}

{Point of Contact Title}

{Address Line 1}

{Address Line 2}

Phone: {Phone Number}

E-mail: {Point of Contact E-mail}

Architect: Manns Woodward Studios Inc.

Architect of Record: David Woodward

{Point of Contact}

{Point of Contact Title}

8098 Sandpiper Circle, Suite H

Nottingham, Maryland 21236

Phone: 410-344-1460

E-mail: {Point of Contract E-mail}

{Contractors Company Name & Phone Number}

{PROJECT NAME}
OPERATION & MAINTENANCE MANUAL: VOLUME {#}

TABLE OF CONTENTS

Project Directory.....{Page #'s}
{Contractor's Company Name} Warranty.....{Page #'s}
Required Maintenance Schedules.....{Page #'s}
Division 01 – General Requirements.....{Page #'s}
    Owners Additions.....{Page #'s}
    Demonstration and Training Attendance Sign Off.....{Page #'s}
Division 02 – Demolition.....{Page #'s}
    {Items Returned to Owner}.....{Page #'s}
    {Recycled Items}.....{Page #'s}
    {Salvaged Items}.....{Page #'s}
Division 03 – Concrete.....{Page #'s}
    {Insert Items}.....{Page #'s}
Division 04 – Masonry.....{Page #'s}
    {Insert Items}.....{Page #'s}

*****CONTINUE TABLE OF CONTENTS WITH APPLICABLE DIVISIONS AND INCLUSIONS*****

As-Built Drawings.....{Page #'s}
    Civil.....{Page #'s}
    Architectural.....{Page #'s}
    Structural.....{Page #'s}
    Mechanical.....{Page #'s}
    Electrical.....{Page #'s}
    Plumbing.....{Page #'s}
    Fire Protection.....{Page #'s}

*****CONTINUE TABLE OF CONTENTS WITH APPLICABLE DICIPLINES*****

Page #

{Contractors Company Name & Phone Number}

{PROJECT NAME}

{Address Line 1}
{Address Line 2}

PROJECT DIRECTORY

OWNER

{Entity Name of Owner}

{Owner Address Line 1}

{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

GENERAL CONTRACTOR

{Entity Name}

{Owner Address Line 1}

{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

ARCHITECT

{Entity Name}

{Owner Address Line 1}

{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

{Contractors Company Name & Phone Number}

{DESIGN TEAM MEMBER AS LISTED ON DRAWING COVER SHEET}

{Entity Name}

{Owner Address Line 1}

{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

{SUBCONTRACTOR – list each separately}

{Entity Name}

{Owner Address Line 1}

{Owner Address Line 2}

	Business Phone	Mobile Phone	E-Mail Address
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}
{Point of Contact Name & Title}	{Phone #}	{Phone #}	{E-mail Address}

{CONTRACTORS WARRANTY, ON COMPANY LETTERHEAD, SIGNED BY COMPANY REPRESENTATIVE AUTHORIZED TO SIGN BINDING DOCUMENTS}

{Contractors Company Name & Phone Number}

{PROJECT NAME}

{Address Line 1}
{Address Line 2}

REQUIRED MAINTENANCE SCHEDULES

*****INCLUDE ALL REQUIRED MAINTENANCE FOR EQUIPMENT AND FINISHES*****

{Contractors Company Name & Phone Number}

Division {#}
{Division Title}

*****Division Separator Page (Electronic Manual);
Hyperlink or bookmark this page in the Table of Contents*****

*****Tab Divider (Physical Manual);
Print on Card Stock divider with numbered tab*****

{Contractors Company Name & Phone Number}

Division {#}

{Division Title}

*****LIST CONTENT OF EACH "DIVISION" SECTION ON THIS CONTENT PAGE*****

{Content Name}.....{Page #'s}
{Content Name}.....{Page #'s}

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
1. All software-operated systems.
2. HVAC systems and equipment.
3. Plumbing equipment.
4. Electrical systems and equipment.
5. Conveying systems.
6. Landscape irrigation.
7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
2. Finishes, including flooring, wall finishes, ceiling finishes.
3. Fixtures and fittings.
4. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
1. Submit to CMa for transmittal to Architect and Owner.
2. Submit not less than four weeks prior to start of training.
3. Revise and resubmit until acceptable.
4. Provide an overall schedule showing all training sessions.
5. Include at least the following for each training session:
    a. Identification, date, time, and duration.
    b. Description of products and/or systems to be covered.
    c. Name of firm and person conducting training; include qualifications.
    d. Intended audience, such as job description.
    e. Objectives of training and suggested methods of ensuring adequate training.

f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
g. Media to be used, such a slides, hand-outs, etc.
h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Provide training in minimum two hour segments.

C. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

D. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
1. The location of the O&M manuals and procedures for use and preservation; backup copies.
2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

E. Product- and System-Specific Training:
1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

F. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 7900

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SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:
1. Division 31 Section “Earth Moving”: Drainage fill under slabs-on-grade.
2. Division 32 Section “Concrete Pavement”: Concrete pavement and walks.
3. Division 03 Section “Hydraulic Cement Underlayment”: Self-leveling underlayment for interior finish flooring, flatness and levelness repair for new slabs, and preparing existing concrete slabs.
4. Division 03 Section “Non-Shrink, Non-Metallic Grouting”: Grout under steel base plates, bearing plates and other areas included.
5. Division 05 Section “Structural Steel”: for anchor bolts, leveling [and embedded] plates.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, and ground-granulated blast-furnace slag, subject to compliance with requirements.

B. Defective Concrete: Concrete not meeting any of the following requirements:
1. Specified thickness, flatness, levelness or variation from elevation.
2. Free of excessive cracking as defined in ACI.
3. Free of individual cracks greater than 1/16 inch thick.
4. Specified compressive strength.
5. Embedded debris in concrete work.
6. New concrete slabs that are not treated with specified moisture vapor emission control products during installation and subsequently fail to pass moisture testing specified in Division 09 shall be considered defective concrete and shall be remediated by methods acceptable to Architect.

C. MVE: Moisture Vapor Emission

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete mixture. Submit laboratory test reports for concrete materials and concrete mix design on the Concrete Mix Design Submittal Form attached to the end of this section. Each mix design shall be accompanied by either a standard deviation analysis or trial mixture analysis backup in accordance with ACI 318. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
1. Submit strength test results, statistical and historical strength test data, trial batch mix designs, and other test information specified for each proposed mix design. Mix design, testing, and laboratory work shall commence upon award of contract to insure that correct designs are developed in time

for field use. The testing service shall submit to the Architect proposed concrete mix design proportions and all applicable reference data for each type of concrete a minimum of fifteen (15) days prior to the start of work. Do not start concrete production until the data has been reviewed and approved by the Architect.

C. Steel Reinforcement Shop Drawings: Submit shop drawings of reinforcing steel. Dimensions shall be shown on plans and sections to indicate clearances and laps. Indicate material, grade, stirrup spacing, reinforcement sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules and supporting and spacing devices. Include special reinforcement required for openings through concrete structures. Indicate location of construction joints on reinforcing drawings.
1. Conform to ACI 315:SP-66 in the preparation of reinforcing shop drawings.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
1. Formwork Shop Drawings shall be signed and sealed by a Professional Engineer indicating compliance with all applicable codes.
2. For concrete exposed to view in the final work, show form construction, including jointing, special form joints or reveals, location and pattern of form tie replacement and other items which affect exposed concrete visually.
3. Architect’s review is for general appearance features only.
4. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
5. When the load on the shores exceeds 150 pounds per square foot, or when power buggies are used, the Contractor shall certify that the form, shore, and bracing design has been checked and approved by a professional engineer licensed in the state of the project.

E. Construction Joint/Saw-Cut Joint Shop Drawings: Submit separate shop drawings for location of construction joints and saw-cut joints with reinforcement shop drawings.

F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcements and reinforcement accessories.
4. Fiber reinforcement (if applicable).
5. Admixtures.
6. Waterstops.
7. Curing materials.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor Barriers.
12. Epoxy/semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

G. Concrete Delivery Tickets: Submit concrete delivery tickets to the field testing agency for each truckload discharged and used in the work in accordance with ASTM C94 including, but not limited to the following; the truck number, date, and time that mixing was started with each batch at time of delivery. The

Contractor shall complete the ticket by indicating the arrival time, depositing time and concrete placement location. The delivery ticket shall also contain the project name and number; date; mix type including strength, aggregate type, admixture used, amount of water, and design slump; and batch quantities. Failure to deliver such completed ticket shall be cause for rejection, removal, and replacement by the Contractor at any time or stage of the work.

H. Minutes of preinstallation conference.

I. Warranty: Sample Warranty for Moisture Vapor Emission Control admixture.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
1. Concrete floor finishing shall be performed by a company specializing in concrete floor finishes with 10 years experience.

B. 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 formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment. Manufacturer must be certified according to the National Ready Mixed Concrete Association's "Certification of Ready Mixed Concrete Production Facilities."

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
1. Brand of cement shall not be changed during process of job unless approved in writing by Architect.

F. Concrete work shall conform to the requirements of the following, unless provisions that are more stringent are indicated in the Contract Documents:
1. ACI Publications:
a. ACI 301 Specifications for Structural Concrete for Buildings, Sections 1 through 5[and Section 7, "Lightweight Concrete"][Section 6, "Architectural Concrete"].
b. ACI 117 "Specifications for Tolerances for Concrete Construction and Materials."
c. ACI 212 "Chemical Admixturers for Concrete."
d. ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete."

G. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
   1. Prior to submittal of the concrete mix designs, the Contractor Shall hold a meeting to review the detailed requirements for preparing the mix designs and to determine the procedures for producing proper concrete construction.
   2. The Contractor shall prepare an agenda for this meeting. The approved agenda shall be distributed to all parties attending the conference one week prior to the meeting.
   3. Review procedures for ensuring quality of concrete materials including, but not limited to, the following items:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Cold- and hot-weather concreting procedures.
      c. Locations of construction contraction and isolation joints.
      d. Forms and form removal limitations.
      e. Shoring and reshoring procedures.
      f. Vapor-barrier installation.
      g. Anchor rod and anchorage device installation tolerances.
      h. Steel reinforcement installation.
      i. Concrete repair procedures.
      j. Concrete protection.
      k. Hardeners and Sealers.
   4. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Independent testing agency responsible for concrete design mixes.
      b. Architect/Engineer.
      c. Contractor.
   5. Concrete field inspector.
      a. Concrete installer/finisher.
      b. Installers of items embedded in concrete.
      c. Installers of finishes applied directly to concrete including, but not limited to, thinset terrazzo and resilient flooring.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. The Contractor shall be responsible for any costs due to failure to unload or store material properly. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures.

C. Protection: Protect the materials of this section before, during, and after installation and to protect the installed work and materials.

D. Protect adjacent finish materials against spatter during concrete placement.

E. Cementitious materials shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter.

1.6 COORDINATION

A. Coordination: Coordinate preparation and installation of concrete with radon control provisions indicated on Drawings, including sealing penetrations, joints and perimeter conditions in concrete elements.

B. Coordination with Structural Steel: Verify proper positioning and secure anchor bolts, inserts, bearing plates, embedded angles, etc.

1.7 MOISTURE TREATMENT WARRANTY

A. Concrete slabs treated with specified moisture vapor emission reduction control product shall be warranted by the manufacturer against failure of the floor covering system due to moisture vapor migration or moisture-born contaminates for a period of fifteen (15) years from date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission and moisture-born contaminates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Where products are indicated as the Basis of Design, provide the specified product or a comparable product by one of the listed manufacturers.

2.2 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. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
a. Medium-density overlay, Class 1, or better, mill-release agent treated 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. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. 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. Verify by testing or other acceptable means, compatibility of form-release agent with subsequent finishes. Contractor shall rectify any form-release agents that are not compatible with specified finishes.
2. [Formulate form-release agent with rust inhibitor for steel form-facing materials.]

F. 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 to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

C. Anchor Bolts: Steel bolts complying with ASTM F 1554, Grade 55; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated.
1. Anchors in Contact with Preservative Treated Lumber: Where anchor bolts are in contact with ACQ preservative treated lumber, provide anchor bolts and washers fabricated from stainless steel complying with ASTM A 276 or ASTM A666, Type 304 and nuts fabricated from stainless steel complying with ASTM F 594, Alloy Group 1, CW.

D. All hooks, unless otherwise noted, shall conform to diameters and dimensions of "ACI Standard Hooks."

E. Wire for securing bars in place shall not be less than 16-gage wire.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or as acceptable, Type II.

B. Pozzolans:
1. Fly Ash: ASTM C 618, Class C, the maximum Loss of Ignition (LOI) shall be less than 3%.
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

3. The cement shall not contain any ingredients, shown by cement mill certificates, that would cause more than 2 percent air to be entrained in the concrete when cement is used in the concrete mix.

C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
   1. Class: Severe weathering region, but not less than 3S.
   2. Nominal Minimum Aggregate Size: 3/4 inch.
   3. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
      a. Coarse Aggregate: ASTM C 33 washed natural aggregate, free of clay, mud, loam or foreign matter, and fine materials. Maximum size shall be 1".
      b. Pea gravel shall be graded for 90% passing the 3/8 inch screen and 90% retained on the 1/4 inch screen. Use pea gravel only in sections less than 1-1/2 inches in thickness, or when acceptable to the Architect.
      c. Fine Aggregates: ASTM C 33, natural sand, washed and having no more deleterious substances than allowed in Table I of ASTM C 33 and Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330.
   1. Nominal Maximum Aggregate Size: 3/4 inch.
   2. Provide uniformly graded aggregate. The maximum size of coarse aggregate shall not exceed one-fifth of minimum dimension between forms of member for which concrete is to be used, three-fourths of minimum clear spacing between reinforcing bars or 1 inch, whichever is smaller. Aggregate stockpiles at the batch plant shall be maintained at a moisture content of not less than 85 percent of the saturation established in the mix design data.

E. Synthetic Fiber Reinforcing: Fibrillated fibers made from 100% virgin polypropylene according to ASTM C 1116, Section 4.1.3, Type III.
   1. Basis of Design Product: Master Builders Master Fiber F100
   2. Follow manufacturer’s written recommendation for dosage with 1.5 pounds/C.Y. min.

F. Water: Potable and complying with ASTM C 94.

2.6 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride. All admixtures shall be used in strict accordance with the manufacturer's written instructions. No admixture shall cause an increase in shrinkage when tested in accordance with ASTM C 494.

B. With the exception of concrete MVE control admixture, use only one manufacturer as a source for all admixtures. Admixtures of various manufacturers within a particular mix will not be permitted. Subject to compliance with requirements, provide products by one of the following:
   1. Sika.
   2. Master Builders.
   3. Euclid Chemical Co.
   4. L & M Construction Chemicals.
   5. L. M. Schofield Company.

C. Air-Entraining Admixture: ASTM C 260.

D. Water-Reducing Admixture: ASTM C 494, Type A.

E. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

F. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

G. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

H. Moisture Vapor Emission Control Products:
1. Basis of Design Product: ISE Logik – MVRA 900
2. Subject to compliance with requirements provided Basis of Design product or one of the following:
   a. AVECS Pro-Act
   b.
3. Follow Manufacture'r written recommendations for dosage
4. Admixture to be added at the plant per manufacturer written recommendations.

2.7 WATERSTOPS

A. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophilic material for adhesive bonding to concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
   b. Hydrotite; Greenstreak.
   c. CCW Mirastop; Carlisle Coatings and Waterproofing.
   d. Henry Company; Hydroflex.
   e. "Idrostop" by MAPEI.

B. Flexible PVC Waterstops: CE CRD-C 572 With factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Vinylex, Dayton Superior
   b. PVC Waterstop by Greenstreak.
   c. PVC Watestop by W. R. Meadows.

2.8 VAPOR RETARDER/BARRIER

A. Vapor Retarder or Vapor Barrier: Provide geomembrane sheet including manufacturer's recommended adhesive or pressure sensitive tape and other required accessories, for application below all interior concrete slabs.
1. Description: ASTM E 1745, Class A, not less than 15 mils thick.
2. Performance: Physical properties not less than the following when tested according to ASTM E 96:
   a. Water Vapor Permeance: 0.012 perms.fdhj
   b. Water Vapor Transmission Rate: 0.006 g/sf/hr or lower.
3. Products: Subject to compliance with requirements, provide one of the following
   a. Florprufe 120; GCP Applied Technologies.
   b. Griffolyn T-105; Reef Industries Inc.
   c. Stego Wrap (15 mils); Stego Industries, LLC.

d. Moistop Ultra A; Fortifiber Corporation.
e. Vapor Block 15; Raven Industries.
f. Perminator 15; W. R. Meadows.

2.9 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
1. Locations: Apply penetrating liquid floor treatment to exposed concrete floors in garages and other interior areas subject to vehicular traffic.
2. Products: Subject to compliance with requirements, provide one of the following:
a. Dayton Superior Day-Chem Sure Hard(J-17).
b. Conspec by Dayton Superior: Intraseal.
c. ChemMasters; Chemisil Plus.
d. L&M Construction Chemicals, Inc.; Seal Hard.
e. Meadows, W. R., Inc.; Liqui-Hard.

2.10 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1D, Class B, dissipating.
1. Locations: Apply waterborne, membrane-forming curing compound to exposed exterior concrete unless otherwise indicated.
2. Products: Subject to compliance with requirements, provide one of the following:
a. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
b. Lambert Corporation; Aqua Kure-Clear.
c. Meadows, W. R., Inc.; 1100 Clear.
d. US Mix Products Company; US Spec Maxcure Resin Clear.
e. Clear, with fugitive dye; Lambert Aqua Kure-Fugitive Dye.
3. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9-oz. per sq. yd. dry.

D. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Locations: Apply waterborne curing and sealing compound to exposed interior concrete floors not indicated for another finish.
2. Products: Subject to compliance with requirements, provide one of the following:
a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
b. Polyseal WB; ChemMasters.
c. UV Safe Seal; Lambert Corporation.
d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
e. Vocomp-30; W. R. Meadows, Inc.

E. Moisture Vapor Emission Reduction Control Treatment: For use as a sealer, hardener, vapor barrier, and curing compound, concrete surface treatment applied the day of the pour in lieu of other curing methods for on grade or elevated concrete slabs receiving resilient flooring such as sheet vinyl, vinyl composition tile, rubber tile, wood flooring, carpet, epoxy coatings and overlays such as epoxy terrazzo.

1. Applicable to slabs not receiving MVE control admixture.
2. Description: ASTM C1315, Type 1, Class A, ASTM C309, Type 1, Class A, penetrating product to have no less than 34% solids content, leaving no sheen, volatile organic content (VOC) content rating meeting Ozone Transport Commission limits. Product to have at least a five year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all floor finish materials. Epoxy or resin type vapor systems are not acceptable as they are not compatible with flooring adhesives.
3. Locations: Subject to contractor's decision, apply moisture treatment to interior green concrete floor slabs receiving finishes specified in Division 09. Contractor shall provide this treatment for all slabs receiving Epoxy Terrazzo.
4. Basis of Design Product: For treatment applied after initial finishing of poured green concrete, provide Uzin Utz PE 420.

2.11 RELATED MATERIALS

A. Joint-Filler Strips: Closed cell isomeric polymer foam.
   1. Product: Subject to compliance with requirements, provide "Ceramar"; W.R Meadows or approved equivalent.
   2. Application: Interior joints.

B. Key Joints for Slabs-on-Grade: Provide joint forming units with removable cap to create void for joint sealant.
   1. Product: Key-Loc Joint System; Form-A-Key Products Div., Cardinal Manufacturing Company, Inc.

C. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

D. Reglets: Fabricate reglets of not less than 0.0217-inch thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Sleeves: Hot-dipped galvanized schedule 40 or 80 steel pipe conforming to ASTM A53, Grade B, size as indicated on drawings.

2.12 REPAIR MATERIALS

A. Concealed Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

B. Exposed Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.
5. Products: Subject to compliance with requirements, provide one of the following:
   a. "Levelayer III" by Dayton Superior.
   b. "Levelex HS" by L&M Construction.
   c. "Certi-Vex SLU TC" by Vexcon.
   d. "Ultratop" by MAPEI.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene..

D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Euco Epoxy" #452MV or #620 by the Euclid Chemical Company, or
   b. "Sikadur 32" by the Sika Chemical Corporation.
   c. "Planibond EBA" by MAPEI.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
2. Minimum requirements shall be as stated below unless otherwise noted.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Cementitious Materials: Limit cementitious materials in concrete as follows:
1. Portland Cement.
2. Fly Ash.
3. Combined Fly Ash and Pozzolan.
4. Ground Granulated Blast-Furnace Slag.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Piers: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 3000 psi.
2. Slump: 3 inches, plus or minus 1 inch.
3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
4. Maximum Water-Cement Ratio: 0.50.
5. Air entrain as specified below.

B. Slab-on-Grade, Proportion normal-weight concrete mix with synthetic fiber reinforcing as follows:
1. Compressive Strength (28 Days): 4000 psi.
2. Slump: 3 inches, plus or minus 1 inch.
3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
4. Maximum Water-Cement Ratio: 0.45.

5. Air entrain as specified below.
6. Vapor Emission Control Admixture for Interior Slabs
7. Synthetic fiber minimum dosage: 1.5 pounds per cubic yard.

C. Retaining Walls, Foundation Walls, and Steps: Proportion normal-weight concrete mix as follows:
1. Compressive Strength (28 Days): 4000 psi.
2. Slump: 3 inches, plus or minus 1 inch.
3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.
4. Maximum Water-Cement Ratio: 0.45.
5. Air entrain as specified below.

D. Lean Concrete: Use for over excavation of footings and where indicated.
1. Compressive Strength (28 days) - 1500 psi minimum.
2. Slump: 6" maximum.

E. Air Content for Exterior Concrete Elements Subject to Freezing: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
1. Air Content: 6 percent for 3/4-inch-nominal maximum aggregate size.

F. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

G. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

H. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) 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 required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use vapor emission control admixture for interior concrete slab on grade

I. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant: Revisions to the mix design shall be made at no cost to the Owner and shall be subject to the Architect's approval. Laboratory test data for revised mix design and strength results must be submitted to and approved by Architect before being used in work.

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
1. Deliver concrete at temperature of not less than 60 deg F.

2. When air temperature is below 32 deg F, uniformly heat water (and aggregates if necessary) before mixing to obtain a concrete mixture temperature of not less than 65 deg F.
3. Do not deliver concrete at temperature more than 80 deg F.
4. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. All concrete materials, including water, shall be added at the batching plant except for high-range water reducer, which will be added at the site after the initial slump has been measured. No water shall be added at the site.

PART 3 - EXECUTION

3.1 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 concrete 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. 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. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
1. Do not use rust-stained steel form-facing material.

D. 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.

E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

F. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

G. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

H. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
1. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
2. Where concrete surfaces are scheduled to receive paint, stain or coatings, use a form-release agent that is compatible as demonstrated by testing or other means acceptable to Architect.

I. Installation of all formwork shall be in strict accordance with shop drawings certified by the Contractor’s Professional Engineer.

J. The design, tolerance of finished lines and camber to compensate for deflection due to weight of fresh concrete shall conform to ACI-347, "Guide to Formwork for Concrete."

K. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8" for smooth-formed finished surfaces exposed to view in the finished work.
2. Construct forms sufficiently tight to prevent leakage of concrete mortar.
3. 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.
4. Chamfer exterior corners and edges of permanently exposed concrete unless otherwise noted. Provide ¾-inch chamfer strips on external corners of beams and tops of piers or pedestals.

3.2 EMBEDDED ITEMS

A. Set and build into the work, pipes, sleeves, anchor bolts, inserts, reglets, anchor slots, waterstops, conduits, and other embedded items as indicated or 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 item to be embedded. Secure anchor items into correct location and alignment
1. Install anchor bolts, accurately located, to elevations required.
   a. Anchor bolt threads shall be oiled and protected with weatherproof caps. Use anchor bolt setting template to accurately set bolts.
2. Install reglets to receive through-wall flashings.
3. Install dovetail anchor slots in concrete structures, abutting masonry, and as indicated.
4. Coordinate anchorage of embedded drains, conduit and boxes to maintain critical elevation and location with installer of embedded items. Where embedded items do not maintain position and elevation, cut out concrete, reset item and repair concrete.
5. Conduits and pipes embedded in concrete slabs, beams and walls shall be in accordance with ACI Building Code requirements, latest edition, and as herein specified. At no point shall the concrete covering be less than ¾ inch.
   a. Where there are banks of conduits or pipes in slabs, 6" x 6" - #6 mesh shall be placed under or over these banks of conduits or pipes and run beyond each side at least 12 inches.
   b. Extra reinforcement shall be installed as per Architect's directions for conduits and pipes, penetrating walls, etc.
   c. Any conduit or bank of conduits or pipes which impair the structural strength of the structural element involved shall not be permitted.
   d. No conduit and/or pipe shall be tied parallel to the reinforcing bar which would reduce bond of same reinforcing bar.
   e. No aluminum conduit and/or pipe shall be allowed to be embedded in concrete.
   f. Where there are expansion joints, proper conduit or pipe expansion sleeves shall be installed to allow proper freedom of movement.
   g. No conduits shall be placed to run through columns, including the slab or beams within the area of any column.
   h. Conduit in structural slab shall be permitted only for home runs and branch conduit work for fixtures in exposed ceiling areas.

3.3 VAPOR RETARDER/BARRIER

A. Vapor Retarder/Barrier: Place, protect, and repair vapor retarder/barrier sheets according to ASTM E 1643 and manufacturer's written instructions.

1. Lap vapor barrier a minimum of 12 inches and tape joints using manufacturer's recommended adhesive tape.
2. Turn up vapor retarder/barrier at slab edges and floor penetrations and seal vapor retarder/barrier to wall or penetration.
3. Ensure the subbase is approved by the Geotechnical Engineer. Level, tamp, or roll aggregate, sand, or tamped earth base as required.
4. Repair damaged areas of the vapor barrier in accordance with manufacturers instructions.
5. Comply with Federal or State code requirements when vapor barrier is utilized as a component of Radon mitigation.
6. Obtain approval of Owner's testing agency for integrity of vapor barrier before pouring slabs on grade.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
1. Do not cut or puncture vapor retarder/barrier. Repair damage and reseal vapor retarder/barrier before placing concrete.

B. Reinforcing shall be cold bent to the shapes indicated. The use of heat to bend is prohibited. Do not rebend in field without permission of the Architect.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 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.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Where screed keys are indicated, form joints from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate and form shrinkage and construction joints where indicated on Drawings. No other joints are permitted unless approved by Architect in writing. Reinforcing shall not be interrupted at construction joints. Keyways shall be a the thickness of the member unless otherwise indicated.

C. Contraction 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-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.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than ½ inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
   1. Use PVC dowel sleeves to prevent concrete bonding to one side of joint.

3.6 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

B. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

3.7 CONCRETE PLACEMENT

A. Concrete Volume: Contractor shall provide all concrete volume necessary to accommodate structural steel cambers, natural and induced, and to compensate for deflection of structural steel members, deflections of composite steel deck, deflection and settlement of formwork, low points of porous fill, and all other construction influences on the actual volume of concrete placed.

B. Notify Architect minimum 24 hours prior to commencement of concreting operations.

C. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

D. Do not add water to concrete during delivery, at Project site, or during placement.

E. Test concrete slump immediately upon arrival at project site. Concrete that is not in conformance with the requirements of the Contract Documents (approved mix design) shall be rejected and removed from the site.

1. HRWR/Superplasticizer is not to be added at the plant, and if required, shall be added at the site in accordance with the manufacturer's instructions.

F. Deposit concrete continuously or in 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 specified. Deposit concrete to avoid segregation.

G. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints. Do not deposit concrete with a distance greater than 48 inches between concrete discharge and bottom of form.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

H. Deposit and consolidate concrete for floors and slabs in a continuous operation, in accordance with recommendations in ACI 302.1R and within limits of construction joints, until placement of a panel or section is complete.
1. Strip placement shall be used in lieu of block placement techniques to achieve the flatness and levelness criterial established elsewhere in this section.
2. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Slope surfaces uniformly to drains where required.
6. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
    a. Do not use magnesium bull floats.

I. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. Maintain temperature of concrete as specified in Part 2 for "Ready-Mixed Concrete."
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

J. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

K. Maintain concrete cover around reinforcing as specified in ACI 318 unless indicated otherwise on the contract documents.

L. Excavations shall be cleared of loose soils, rocks, debris, water, and ice. Areas that have sloughed shall be tamped firm. Dry soils shall be made damp immediately prior to placement.

M. Forms shall be cleared of wood, sawdust, dirt, debris, water, and ice. Particular attention shall be given to the removal of dirt and debris from all formed construction joints.

N. Concrete shall be mixed in such quantities to insure placement prior to loss of slump. Addition of water to restore slump lost due to excessive mixing or placement delays will not be permitted. Redosage with the specified high-range water-reducing admixture regarding dosage and time periods.

O. Convey concrete from mixer to placement location as rapidly as possible by methods, which will not cause segregation or loss of ingredients. Use chutes, buckets, conveyors or buggies to convey concrete. Deposit concrete as close as possible to its final location.

P. Unless otherwise provided, concrete footings and exterior slab and foundations shall be placed directly on undisturbed or structurally compacted backfill surfaces that are thoroughly moistened but not muddy at time concrete is placed. There shall be no free water present at footing bottoms between time of final excavation to grade and concrete placement.

Q. Where established bottoms of footings for bearing as shown on drawings have not been maintained or have been disturbed, all loose material shall be removed to good bottom and the footings may be placed at the lower level with increase in length of vertical reinforcement required to reach the lowered footing or a plain concrete pad may be placed up to the former level of bottom of footing.

R. Placing of concrete in supported elements shall not be started until the concrete previously placed in walls and columns is no longer plastic.

S. Maintain reinforcement, forms, and embedded items in their proper positions during placing operations. Tighten forms as necessary to prevent leakage.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

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 defective areas. Remove fins and other projections exceeding 1/8 inch in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, painting, or gypsum board.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete exposed to public view in the completed Work:
   1. 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.

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.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. 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 indicated, and to surfaces to receive trowel finish.
   2. Apply wood float finish to slabs-on-grade indicated for thinset epoxy-terrazzo flooring.

C. Trowel Finish: After applying float finish, apply first trowel finish 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 indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, paint, or another thin film-finish coating system, except thinset epoxy-terrazzo flooring.
   2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155 for a randomly trafficked floor surface in addition to the recommended guidelines established in ACI 117 and ACI 302:
      a. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 26; and levelness, F(L) 18; for slabs-on-grade.
      b. Finished floor elevation of suspended slabs shall be within 3/8 inch of specified elevation with specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and levelness, F(L) 15. Slab thickness shall be increased only as required to compensate for deflection of steel framing and deck.
      c. Specified overall values of flatness for slabs receiving wood athletic flooring, F(F) 50; and levelness, F(L) 33; with minimum local values of flatness, F(F) 26; and levelness, F(L) 18; for slabs-on-grade.

D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

E. Broom Finish: Apply a broom finish to exterior concrete slabs and stairs.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Remove surface exposed fibers [from synthetic fiber reinforcing] protruding above surface 30 days minimum after placement.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces as required for scheduled finish.

3.11 CONCRETE PROTECTION 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 with recommendations in ACI 305R 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 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

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, 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.
    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces at interior locations, except as otherwise indicated.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
3. Curing and Sealing Compound: Apply uniformly only to floors and slabs indicated to receive no other finish 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.
    a. Apply final coat immediately before substantial completion.
    b. Do not seal concrete floors scheduled for painting.

E. Protect interior floor slabs from accumulation of standing water. Provide temperature and moisture controlled environment as specified in temporary provisions to promote drying of floor slab.

3.12 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment for Exposed Concrete: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete until it has cured for period recommended by manufacturer of penetrating liquid floor treatment.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer’s written instructions.

C. Moisture Vapor Emission Reduction Control Treatment for Concrete Slabs receiving resilient flooring finishes: Subject to contractor’s decision, prepare, apply, and finish penetrating liquid floor treatment to concrete slabs receiving finishes specified in Division 09 except for slabs receiving epoxy terrazzo treatment is mandatory. Apply treatment according to manufacturer's written instructions, the day of the concrete pour or as soon as harsh weather permits, prior to application of any other chemical treatment.
1. Manufacturer’s technician shall be on site each day during concrete slab placement to assure proper application of treatment.
2. Treatment shall be applied to concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain foot traffic without damage.
3. Spray apply at a rate of 200 square feet per gallon. If puddling or bird bathing occurs. Lightly broom treatment evenly over the substrate until treatment has completely penetrated into the surface.
4. If, within two hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply the treatment to the areas as soon as weather conditions permit.

3.13 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 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 ½ inch in any dimension in solid concrete but not less than 1 inch in depth. 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 wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions. Where frequency of defects is greater than one per 3 square feet, cut out defects that penetrate to reinforcement and repair as specified below for repair of defective areas, then repair entire surface as specified below for correction of other low areas scheduled to receive floor coverings. Where frequency of defects is less than one per 3 square feet, repair each defect individually.
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.
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 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 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 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same

materials and mix 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 or less in diameter with patching mortar. Groove top of cracks, 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.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage and pay a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change. Initial slump test shall be taken prior to adding high range water reducer and prior to placing any concrete.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days. Hold one cylinder for testing at 56 days at Architect's option.

a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

D. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

E. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

F. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing if test results show non-compliance with requirements, and within 7 days of testing otherwise.
1. Notify Architect within 24 hours of testing if test results show non-compliance with requirements.
2. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

G. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

H. Flatness and Levelness: For all floors required to meet flatness of Ff 35 or higher, measured within 24 hours according to ASTM E 1155. Retesting required for floors not meeting specified requirements shall be at Contractor's expense.

I. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03 3000

SECTION 033001 - CAST-IN-PLACE CONCRETE – SITE WORK

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Sidewalk.
2. Curb.
3. Slabs-on-grade.
4. Fence posts.
5. Bollard foundation.

B. Related Requirements:

1. Section 310000 "Earthwork" for drainage fill under slabs-on-ground.
2. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Aggregate
3. Admixtures.
4. Form materials and form-release agents.
5. Steel reinforcement and accessories.
6. Fiber reinforcement.
7. Waterstops.
8. Curing compounds.

9. Floor and slab treatments.
10. Bonding agents.
11. Adhesives.
12. Vapor retarders.
13. Semirigid joint filler.
14. Joint-filler strips.
15. Repair materials.

B. Quality Control: Submit a Minimum Quality Control Plan for Field Placement Concrete Operations (PennDOT Form CS-704). Prepare a field operation QC Plan for the Representative's review, on PennDOT Form CS-704, to evaluate concrete field operation. Submit the field operation QC Plan at the Pre-construction conference or at least 3 weeks before the first concrete pour. Describe the construction equipment, personnel, and methods necessary to construct and test concrete courses for all structural elements. Include testing frequencies and action points to initiate corrective measures. Do not establish action points at either the upper or lower specification limits.

1.5 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.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Contractor shall provide a qualified independent engineering testing agency to perform material evaluation tests and to design concrete mixtures.

G. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.
e. 28-day compressive strength.
f. Evaluation of permeability-reducing admixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that 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.

3. Overlaid Finnish birch plywood.

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 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. Pan-Type Forms: Formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, 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.

J. Coatings

1. Prepare surface to be coated in accordance with the written instructions of the coating manufacturer, including cleaning, sandblasting or acid etching as necessary.

2. Exterior Surface Coatings (2 coats required) - Use one of the following manufacturers:

a. Koppers Company, Inc., Bitumastic No. 300-M, 20 mil minimum thickness, each coat.

b. Pennsbury Coating Corporation - Bitu-Chem No. 32-B-4 Pennoxy-Tar, 20 mil minimum thickness, each coat.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

C. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/ A 706M, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M, epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

D. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, assembled with clips.

E. Plain-Steel Wire: ASTM A 82, plain, cold drawn steel.

F. Deformed-Steel Wire: ASTM A 496.

G. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

I. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Zinc Repair Material: ASTM A 780/A 780M.

E. 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," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I or Type II or Type I/II, gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag or Type IP, portland-pozzolan or Type IL, portland-limestone, or Type IT, ternary blended cement.
5. Silica Fume: ASTM C 1240, amorphous silica.

D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do 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.

G. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

H. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

I. Water: ASTM C 94/C 94M and potable.

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Ribbed with center bulb.
2. Dimensions: 9 inches by 3/8 inch thick.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.8 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. 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, nondissipating.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Curing and sealing compounds shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

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.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Slag Cement: 50 percent.
2. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum.
3. Silica Fume: 10 percent.
4. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with silica fume not exceeding 10 percent.
5. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

D. 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, and watertightness.
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 w/c ratio below 0.50.

E. Prepare concrete design mixture to achieve watertightness.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 SLABS-ON-GRADE: PROPORTION NORMAL-WEIGHT CONCRETE MIXTURE AS FOLLOWS:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct 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.

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.

3.2 EMBEDDED ITEM INSTALLATION

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.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 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 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 support 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 are not 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 Engineer.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

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 and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

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 Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction 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. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does 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.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. In accordance with ACI 301.

B. 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.

C. 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 view.

D. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete on exterior walls exposed to view.

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.

E. 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.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct height of concrete bases as directed unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. 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 concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

E. Bollards: Provide concrete fill for bollards.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301 for cold-weather protection and ACI 305.1 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 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. 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 with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1part portland cement to 2-1/2 parts fine aggregate passing a No. 16 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 in any dimension to solid concrete. Limit cut depth to 3/4 inch. 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 matches 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 Engineer.

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 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.

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 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 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 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 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 Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

G. Coating Touch Up – Touch-up chipped, cracked, abraded or otherwise damaged previously coated surfaces with 2 coats of the original coating material.

3.15 FIELD QUALITY CONTROL

A. Testing Agency: Contractor to engage and pay for all costs associated with a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 50-cu. yd. or fraction thereof of each concrete mixture placed each day and for every 5,000 square feet of surface area.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 04 0511 - MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.2 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

B. Section 08 1113 - Hollow Metal Doors and Frames: Products and execution for grouting steel door frames installed in masonry.

1.3 REFERENCE STANDARDS

A. ASTM C91/C91M - Standard Specification for Masonry Cement.

B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

C. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

D. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

E. ASTM C476 - Standard Specification for Grout for Masonry.

F. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

G. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

H. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry.

I. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength.

J. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

K. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.

L. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry.

M. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. For each type of product.
   2. For each type of mortar and grout, include description of design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

D. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

G. 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 TMS 602/ACI 530.1/ASCE 6.

H. Cold-Weather and Hot Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements. It is the Contractors responsibility to determine sequence of Work and project schedule. As such it is the Contractors responsibility to provide within their work scope cold weather and/or hot weather procedures as required to complete the Work within the approved schedule.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

1.6 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in dry location. Do not use cementitious materials that have become damp or wet.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver pre-blended, dry mortar mix in moisture resistant containers. Store pre-blended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

D. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.8 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
1. Do not use frozen materials or materials mixed or coated with ice of frost.
2. Do not build on frozen substrates.
3. 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 then seven days after completing cleaning.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

A. Use only factory premixed packaged dry materials for mortar and grout, with addition of water only at project site.
1. Exception: If a specified mix design is not available in a premixed dry package, provide equivalent mix design using standard non-premixed materials.

B. Mortar Color for Masonry Applications: Natural gray unless otherwise indicated.

C. Mortar Mix Designs: ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. All masonry of Training Buildings and structures shall designated as exterior masonry
2. Masonry below grade and in contact with earth: Type S.
3. Exterior Cavity Walls: Type S mortar with Type N pointing mortar.
4. Exterior, Loadbearing Masonry: Type S.
5. Exterior, Non-loadbearing Masonry: Type S.
6. Exterior Repointing Mortar: Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.
7. Interior, Loadbearing Masonry: Type S.
8. Interior, Non-loadbearing Masonry: Type S.
9. Pointing Mortar for Prefaced or Specially Faced Unit Masonry: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.

D. Grout Mix Designs:
1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.

a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.2 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed masonry cement and mason's sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
1. Type: Types as scheduled in this section.
2. Water repellent mortar for use with water repellent masonry units.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
1. Type: Use grout of type indicated, or if not indicated, of type (fine or course) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

C. Water: Clean and potable.

D. Admixtures
1. Cold Weather Accelerating Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
2. Bonding Agent: Epoxy type.
3. Integral Water Repellent Admixture: Polymeric liquid admixture added to mortar at the time of manufacture.
   a. Performance of Mortar with Integral Water Repellent:
      1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
         a) No water visible on back of wall above flashing at the end of 24 hours.
         b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
         c) No more than 25 percent of wall area above flashing visibly damp at end of test.
      2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
      3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.
   b. Use only in combination with masonry units produced with integral water repellent admixture.
   c. Product: Subject to compliance with requirements, provide one of the following or comparable product by another manufacturer.
      1) ACM Chemistries; RainBloc for Mortar.
      2) Master Builders Solutions; MasterPel 240MA.
      3) GCP Applied Technologies.; Dry-Block Mortar.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

2.4 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.1 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.3 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
1. Limit height of pours to 60 inches.
2. Limit height of masonry to 16 inches above each pour.
3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.

4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.4 FIELD QUALITY CONTROL

A. Testing and Inspecting: 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. Perform field tests, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
1. Begin masonry construction only after inspectors have verified proportions of prepared mortar.
2. Place grout only after inpsectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcemen
3. Place grout only after inspectors have verified proportions of prepared

C. Test and evaluate mortar in accordance with ASTM C780 procedures.
1. Test Prior to Construction: One set of tests.
2. Test Frequency: Once set of tests for each 5000 s.f. of wall area or portion thereof.
3. Test with same frequency as specified for masonry units.

D. Test and evaluate grout in accordance with ASTM C1019 procedures.
1. Test with same frequency as specified for masonry units.

END OF SECTION 04 0511

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete block.

B. Fireclay refractory brick

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Flashings.

F. Lintels.

G. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting.

B. Section 05 5000 - Metal Fabrications: Loose steel lintels.

C. Section 06 1000 - Rough Carpentry or 06 1053 - Miscellaneous Rough Carpentry: Nailing strips built into masonry.

D. Section 07 1113 - Bituminous Dampproofing: Dampproofing parged masonry surfaces.

E. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

F. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

G. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

F. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

G. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.

H. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

J. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.

K. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick.

L. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

M. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.

N. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.

O. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

P. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.

Q. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

R. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength.

S. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.

T. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

U. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry.

V. BIA Technical Notes No. 28B - Brick Veneer/Cold-Formed Steel Framed Walls.

W. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

X. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.

Y. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

Z. UL (FRD) - Fire Resistance Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for each product type including, but not limited to, masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
1. Masonry Units: Indicate sizes (dimensions), profiles, coursing, and locations of special shapes.
2. Indicate anchorage, size and type of fasteners
3. Reinforcing Steel: Detail bending, laps, lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
5. Indicate locations of expansion and control joints on elevations where elevation of walls is provided within Contract Documents. Otherwise show locations of joints on plans.

D. Samples: Submit two samples of fire brick (pavers) units to illustrate color, texture, and extremes of color range.
1. Final Sample Verification:
   a. Submit two full size samples of fire brick (pavers) units to illustrate color, texture, and extremes of color range of selected masonry units.

E. Manufacturer's Certificate:
1. Certify that masonry units meet or exceed specified requirements.
2. Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
3. Cementitious Materials: Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

F. 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 requirements.

G. 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 TMS 602/ACI 530.1/ASCE 6.

H. Cold-Weather and Hot Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements. It is the Contractors responsibility to determine sequence of Work

and project schedule. As such it is the Contractors responsibility to provide within their work scope cold weather and/or hot weather procedures as required to complete the Work within the approved schedule.

I. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

J. Designer's Qualification Statement.

K. Manufacturer's Qualification Statement.

L. Installer's Qualification Statement.

1.6 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

B. Fire Rated Assemblies: Comply with requirements for fire resistance rated assembly designs indicated within Contract Documents.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

E. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
   1. Store on elevated platform in dry location.
   2. Cover units to prevent soiling or becoming wet; If units become wet, dry before installation.

B. Pre-blended, dry mortar mixes: deliver pre-blended, dry mortar mix in moisture resistant containers. Store pre-blended, dry mortar mix in delivery containers on elevated platforms in dry location or in covered weatherproof dispensing silos.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Installed 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 minimum of 24 inches down both sides of walls, and hold cover securely 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 neat 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 CONCRETE MASONRY UNITS

A. Concrete Block, General: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
   2. Special Shapes: Provide nonstandard blocks with exposed surfaces matching exposed faces of adjacent units and configured for corners, lintels, headers, jambs, sashes, control joint edges, bonding, and other detailed conditions.
      a. Provide bullnose units for outside corners of units with interior exposed corners unless otherwise indicated.
   3. Integral Water Repellent: Provide units with integral water repellent that are visible and are exposed to weather/weathering (exterior units) and direct water contact (interior units).
      a. Masonry of all training buildings and structures shall be classified as exterior masonry.
      b. Polymeric liquid admixture added to concrete masonry units at time of manufacture.
      c. Performance of Units with Integral Water Repellent:
         1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
            a) No water visible on back of wall above flashing at the end of 24 hours.
            b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
            c) No more than 25 percent of wall area above flashing visibly damp at end of test.
         2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
         3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.
      d. Use only in combination with mortar that also has integral water repellent admixture.
      e. Use water repellent admixtures for masonry units and mortar by a single manufacturer.

4. Load-Bearing Units: ASTM C90, normal weight.
    a. Unit Compressive Strength: Provide units with minimum average net compressive strength of 2150 psi.
5. Nonloadbearing Units: ASTM C129, normal weight.
    a. Unit Compressive Strength: Provide units with minimum average net compressive strength of 2150 psi.
6. Common/Standard Block Units; for utility purposes or hidden or painted installations only, unless noted otherwise.
    a. Smooth face units.
    b. Color: Gray

2.2 BRICK UNITS

A. Fireclay Refractory Brick: ASTM C27 Class Medium-duty; actual size 4-1/2 x 9 x 2-1/2 inches.
1. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
2. Cold Crushing Strength: Not less than 3500 psi.
3. Apparent Porosity: Not more than 18.5 %
4. Bulk Density: 129-133 lb/cf.
5. Modulus of Rupture: Not less than 1000 psi.
6. Method of Manufacture: CONE 29 3018 degrees F.
7. Unit materials shall be in conformance to withstand 1500 degrees constant temperature.
8. Certification: The manufacturer shall certify that the firebrick supplied will meet all standards as required for the job site conditions and intended use.

2.3 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.4 REINFORCEMENT AND ANCHORAGE

A. Reinforcement
1. Uncoated Reinforcing Steel: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (60,000 psi).
2. Masonry Joint Reinforcement, General: ASTM A951/A951M.
    a. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
    b. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
    c. Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
3. Single Wythe Joint Reinforcement: ASTM A951/A951M.
    a. Type: Truss or ladder.
    b. Interior Wall Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
    c. Exterior Wall Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
    d. Size: 0.1483 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

4. Multiple Wythe Joint Reinforcement with Mortar Joint Between Wythes: ASTM A951/A951M.
   a. Type: Truss.
   b. Interior Wall Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   c. Exterior Wall Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
   d. Size: 0.1875 inch side rods with 0.1875 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
5. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
   a. Type: Truss, with adjustable pintle and eye ties spaced at 16 in on center.
      1) Reinforcement shall have one side rod at each face of masonry shell of backing wythe.
      2) Ties shall not have more than 1/16 inch play in any horizontal direction.
      3) Ties shall be sized to extend minimum of half facing wythe but not extend more than 5/8 inch from face of facing wythe.
   b. Material: stainless steel complying with ASTM A580/A580M Type 304.
   c. Size: 0.1875 inch side rods with 0.1875 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
   d. Vertical adjustment: Not more than 1 1/4 inches.
   e. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

B. Ties and Anchors
1. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
2. Partition Top Anchor: 0.105 inch thick metal plate with a 3/8 inch diameter metal rod 6 inches long welded to metal plate and wth closed end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot dip galvanized after fabrication.
3. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
   a. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.024 in thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
   b. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
      1) Basis of Design: Hohmann & Barnard, Inc.;

2.5 FLASHINGS

A. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with metal drip edge.
4. Where flashing is fully concealed, use flexible flashing.

B. Metal Flashing: Provide metal flashing complying with 07 6200 - Sheet Metal Flashing and Trim and as follows:
   1. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.
   2. Fabricate continuous flashing in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   3. Fabricate through wall metal flashing embedded in masonry from stainless steel, with ribs at 3 inch intervals along length of flashing to provide an integral mortar bond.
   4. Fabricate through wall flashing with snap lock receiver on exterior face where indicated to receive counterflashing.
   5. Fabricate through wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out form wall, with outer edge bent down 30 degrees and hemmed.
   6. Fabricate metal expansion joint strips from stainless steel to shapes indicated.
   7. Solder metal items at corners.
   8. Prefabricated Metal Flashing: Sawtooth fabricated 16 oz/sq ft stainless steel (type 304) flashing for thru-wall conditions.
      a. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
         1) Cheney Flashing Company.
         2) Hohmann & Barnard, Inc.
         3) WIRE-BOND.

C. Flexible Flashing
   1. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
      a. Stainless Steel/Polymer Fabric Drainage Plane Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded between one sheet of polymer fabric and one sheet of non-woven drainage material.
         1) Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated or comparable product by another manufacturer.
            a) Basis of Design: York Flashings; Flash-Vent SS.

D. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.
   1. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
      a. 3GEN Masonry Products.
      b. Hohmann & Barnard, Inc.
      c. Mortar Net Solutions.
      d. WIRE-BOND.
      e. York Flashings.

E. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

F. Termination Bars: Stainless steel; compatible with membrane and adhesives.

G. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

H. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.6 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints; ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall.
   1. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
      a. Blok-Lok Limited.
      b. Hohmann & Barnard, Inc.
      c. WIRE-BOND.

B. Joint Filler: Closed cell polyurethane; oversized 50 percent to joint width; self expanding; in maximum lengths available.
   1. Manufacturers: Provide products complying with requirements, from one of the following manufacturers.
      a. Hohmann & Barnard, Inc.
      b. WIRE-BOND.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.7 LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam units matching adjacent units in color texture, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Layout 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.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 PLACING AND BONDING

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. 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.
   1. Units shall not be mitered to form corners; provide special shapes where necessary to form corners with finished faces.

D. Exposed Masonry: Mix units to produce uniform blend of colors and textures, unless otherwise indicated.

E. Where existing masonry occurs, match coursing, bonding, color, and texture of existing masonry.

F. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond pattern; do not use units with less than nominal 4 inch horizontal face dimension at corners or jambs.

G. Lay concealed masonry with all units in a wythe in running bond pattern. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inch horizontal face dimension at corners or jambs.

H. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work. Dp not deeply furrow bed joints or slush head joints.

I. Lay hollow masonry units 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.

J. Where applicable set masonry trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
   1. Clean soiled surfaces with fiber brush an soap powder and rinse thoroughly with clear water.
   2. Wet joint surfaces thoroughly before applying mortar.
   3. Rake out mortar joints for pointing with sealant.

K. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

L. Remove excess mortar and mortar smears as work progresses.

M. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

N. Interlock intersections and external corners, except for units laid in stack bond.

O. Rake out mortar joints at pre-faced CMUs to uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy mortar manufacturer's written instructions.

P. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

Q. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

R. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

S. Cut mortar joints flush where wall tile is scheduled, plaster is scheduled, other direct applied finishes (other than paint) is scheduled, resilient base is scheduled, cement parging is required, cavity insulation vapor barrier adhesive is applied, bitumen dampproofing is applied, or other membrane coating is applied.

T. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
   2. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
   3. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2 inch clearance between end of anchor rod and end of tube. Space anchors 48 inches on center unless otherwise indicated.
   4. At fire rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 8400 - Firestopping.

U. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

3.5 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

1. Unless otherwise indicated, install horizontal joint reinforcement 16 inches on center.
2. Horizontal joint reinforcement in parapets and foundation walls shall be spaced not more than 8 inches on center.
3. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
4. Place continuous joint reinforcement in first and second joint below top of walls.

B. Lap joint reinforcement ends minimum 6 inches.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at wall corners by using prefabricated L-shaped units.

E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

F. Reinforced Unit Masonry
1. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   a. 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.
   b. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
2. Placing Reinforcement: Comply with requirements in TMS 402/602.
3. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   a. Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   b. Limit height of vertical grout pours to not more than 60 inches.

G. Anchoring Masonry to Structural Steel and Concrete:
1. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   a. Provide an open space not less than 2 inches wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   b. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   c. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.6 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Use multiple wythe joint reinforcement installed in horizontal joints to bond wythes together. Space horizontal joint reinforcement as indicated in REINFORCEMENT AND ANCHORAGES - GENERAL article above.

3.7 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing.
2. Where flashing is within mortar joint, place through wall flashing on sloping bed of mortar and cover with mortar.
3. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry; turn up flashing ends at least 1 inch, minimum, to form watertight pan.
4. Seal lapped ends and penetrations of flashing before covering with mortar.

B. At multiple wythe masonry walls, including cavity walls, extend flashing through outer wythe, turn up a minimum of 8 inches, turn and extend through inner wythe to within 1/2 inch of interior face of exposed masonry wall. Where interior masonry wall is covered with furring or other construction assembly continue flashing through inner wythe and turn up interior face 2 inches.

C. Framed or concrete walls with masonry veneer, terminate flashing up 8 inches minimum on vertical surface of backing:
1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer’s directions.
3. Terminate vertical leg of flashing into reglet in concrete.
4. Anchor vertical leg of flashing into backing with a termination bar and sealant.
5. Apply cap bead of sealant on top edge of self-adhered flashing.

D. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

E. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 9200 "Joint Sealants" for application indicated.

F. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

G. Support flexible flashings across gaps and openings.

H. Extend laminated flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

I. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.8 LINTELS

A. Install precast concrete lintels over openings as indicated.

B. Install loose steel lintels or formed-in-place masonry lintels where shown and indicated and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.
1. Provide loose steel lintels unless otherwise indicated.
2. Provide formed-in-place masonry lintels for openings in fire rated masonry walls and masonry walls in damp, wet, or exterior locations.

C. Maintain minimum 8 inches of bearing on each side of opening.

3.9 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement.

C. Locate control joints and expansion joints per drawings. Where joints are not specifically indicated on drawings locate joints to comply with NCMA TEK 10-02D. Location of control and expansion joints shall be indicated on shop drawings and approved by architect prior to the start of masonry installation.

D. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

E. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

F. Form expansion joint as detailed on drawings.

3.10 BUILT-IN WORK

A. As work progresses, build in items as specified in this and other Sections. Fill in solidly with masonry around built-in items.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

E. Fill cores in hollow CMUs with grout 24 inches

F. Do not build into masonry construction organic materials that are subject to deterioration.

3.11 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 or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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 ft., or 1/2 inch 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 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2 inch 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 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft. or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.12 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: 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. Perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Inspections: Special inspections to comply with International Building Code.
1. Begin masonry construction only after inspectors have verified proportions of 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 prepared grout.

C. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.

D. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

E. Mortar Tests: Test each type of mortar in accordance with ASTM C780.
1. Prior to Construction: One set of tests.
2. Frequency: One set of tests for each 5000 sq. ft. of wall area or portion therof.

3.14 REPAIRING, REPOINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-progress cleaning: Clean unit masonry as work progresses by dry brush to remove mortar fins and smears before tooling joints.

D. 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 panel or mock-up assembly; 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 brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.15 PROTECTION

A. Stain Prevention: Prevent construction materials and soil from staining the face of masonry to be left exposed or painted. Immediately remove all deleterious and damaging/staining materials and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud by spreading coverings on ground and over wall surface.

B. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. 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. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste.
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. 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 04 2000

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SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Structural steel.

B. Related Sections include the following:
   1. Division 01 Section "Quality Requirements": Independent testing agency procedures and administrative requirements.
   2. Division 03 Section "Non-Shrink, Non-Metallic Grouting":
   3. Division 05 Section "Steel Deck": Field installation of shear connectors.
   4. Division 05 Section "Metal Fabrications": Steel lintels or shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel.
   5. Division 09 Section "Paints and Coatings": Surface preparation and priming requirements.

C. Products installed, but not furnished, under this Section include the following:
   1. Anchor sections of adjustable masonry anchors for connecting to structural frame, furnished under Division 04 Section "Unit Masonry."

1.2 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.3 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections and moment connections required by the Contract Documents. Connection designs have been completed and connections details have been provided in the Contract Documents.
   1. Engineering Responsibility: Fabricator’s responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections that deviate from the details provided in the Contract Documents.

B. Construction: Type FR, fully restrained.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components. Shop drawings shall be submitted in complete packages so that individual parts and the assembled unit may be reviewed together.
   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.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Submit base plate setting plans, erection plans and detailed drawings for all work.
6. Include details of connections not shown on the Contract Documents.
7. Where provision must be made for attaching other materials to structural steel work, the contractor shall provide the required holes.
8. Use the same column grid numbering system throughout as that shown on the Contract Documents.
9. Provide a steel lintel schedule with associated Lintel Plan.

C. Erection Drawings: Erection drawings shall be submitted in complete packages so that individual parts and the assembled unit may be reviewed together.
1. Erection drawings shall be redrawn to a minimum scale of 1/8" = 1'-0".
2. Materials shall not be ordered, fabricated or delivered before the erection drawings have been reviewed by the Architect and marked with the required status.
3. Include plans showing exact locations of base and bearing plates, and/or bolts and other embedded items.
4. All field connections, not specifically shown on shop drawings, shall be shown on erection drawings.
5. Indicate the size, type, and number of bolts. Indicate the size, type, and length of all field welds

D. Design Calculations:
1. Submit for review design calculations and details of any proposed connections and column splices that deviate from the Contract Documents, before preparation of shop drawings.
2. Connections, that have been fully detailed on the Drawings, need not be further substantiated by calculations produced by the fabricator.
3. Complete calculations shall be submitted that substantiate compliance with the capacities and other design criteria. Calculations shall be performed and sealed by a licensed Professional Engineer.

E. Welding certificates.

F. Qualification Data: For Installer, fabricator, Professional Engineer, and testing agency.

G. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
1. Structural steel including chemical and physical properties and including melting and manufactured country of origin.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program. Firm with not less than 5 years experience with structures of complexity similar to that indicated for this project; with the personnel, organization, experience, procedures, knowledge, equipment, capability and commitment to produce fabricated steel as indicated.

B. Installer/Erector Qualifications: A qualified installer who participates in the AISC Quality Certification Program. Firm with not less than 5 years experience, who has completed structural steel work similar in material, design, and extent to that indicated for this Project.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

D. Bolting: Erector shall furnish a tension measuring device, such as, Skidmore - Wilhelm bolt tension calibrator, at the job site where bolts in slip critical joints or connections subject to direct tension are to be installed and tightened. Erector shall demonstrate to the inspector proper bolt tensioning procedures that conforms to RCSC Standards.

E. Comply with applicable provisions of the following specifications and documents:
1. American Institute of Steel Construction Publications:
   a. AISC's "Code of Standard Practice for Steel Buildings and Bridges." except Sections 1.7.3., 3.2 and 7.9 which shall not be applicable to this project.
   b. AISC's "Seismic Provisions for Structural Steel Buildings".
   c. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
   d. AISC's "Specification for the Design of Steel Hollow Structural Sections."
   e. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
   f. AISC's " Load and Resistance Factor Design"
2. Research Council on Structural Connections:
   a. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 Sections.

1.6 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. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. 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.

1.7 COORDINATION

A. Furnish 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: High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A992, Grade 50

B. Channels and Angles: Carbon Steel: ASTM A36 unless noted otherwise on drawings.

C. Plate and Bar: Carbon Steel: ASTM A572, Grade 50 unless noted otherwise on drawings.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53, Type S, Grade B.
1. Weight Class: Standard, unless noted otherwise on drawings.
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 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
1. Finish: Plain, unless otherwise indicated.
2. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers; plain finish.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 55, as noted on drawings.
1. Configuration: Hooked.
2. Nuts: ASTM A 563 heavy hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436 hardened carbon steel, oversized washers to accommodate oversized holes in base plates
5. Finish: Plain.

E. Threaded Rods: ASTM A 36 or ASTM A 307, Grade A.
1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM F 436 hardened carbon steel.
3. Finish: Plain.

F. Adhesive Anchors: Subject to compliance with requirements, provide products by one of the following:
1. Hilti: HIT Masonry Anchor System.
2. Red Head Anchor Systems.
3. Rawl, Fastener Systems.

G. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer, unless otherwise indicated.

B. Primer for Steel Indicated with Intumescent Coating: Material that is approved by manufacturer of intumescent coating for compatibility with its products.
   1. Basis-of-Design Product: The Sherwin-Williams Company; Kem Bond HS Universal Metal Primer.
   2. Type: Fast-drying, high solids, low-VOC, heavy metal free, rust inhibitive, universal alkyd metal primer.
   3. Color: As selected by Architect. Tint primer for steel with intumescent coating to distinguish it from primer used for typical steel.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, complying with MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, as specified in Division 03 Section “Non-Shrink, Non-Metallic Grouting.”

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's “Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design”.
   1. Camber structural-steel members where indicated.
   2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
   3. Mark and match-mark materials for field assembly.
   4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
   5. All tube steel shall be seal welded. Adequate drainage holes should be drilled to eliminate water traps. The preferred hole diameter, ½ inch, shall be shown on shop drawings and subject to the approval of the Architect.

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.

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. 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 and manufacturer's written instructions.

F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

G. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to

frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.

H. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
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.

I. Supported Lintels: Provide an acceptable adjustable type hanger or clip, with high strength bolts, for vertical and horizontal adjustment for all supported lintels.
1. Lintels shall be supplied to accommodate all openings. Provide a lintel schedule for all openings with shop drawing submissions.

J. Architectural Clearances: Cap plate, seat, and stiffener connections shall not be permitted to interfere with architectural clearances. Particular attention shall be paid to window head and ceiling details. Adjust details to suit.

K. Masonry Wall Anchors: Provide masonry wall anchors welded to steel beams and columns as shown on structural drawings.

L. Stiffeners: Provide web stiffeners in all girders and beams at points of concentrated loads. Fitted stiffeners shall be ground to fit closely against flanges.

2.6 SHOP CONNECTIONS

A. General: All connections shall be AISC standard framed or equivalent. Connections to be adequate to provide for the reactions shown on the drawings, or the reaction due to the maximum uniformly distributed load that the beam is capable of carrying for its span based on the allowable unit stresses, whichever is greater.
1. Connections shall be designed for one half the total allowable uniform load capacity shown in the tables of Uniform Load Constant, Part 2 of the AISC Manual or one bolt greater than the reactions shown on the drawings whichever is greater.
2. Connections: Fabricator Designed Shop and field connections shall be simple framed and have a minimum of two rows of 3/4 inch diameter high strength bolts, unless otherwise indicated, or welds of equal strength. Fasteners shall consist of heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
3. The minimum length of connections shall be at least one-half of the beam “T” dimension as defined in AISC Manual of Steel Construction.

B. 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.

C. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
    a. Grind butt welds flush.
    b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

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.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections, remove overspray.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.
6. Galvanized surfaces not indicated to be exposed.

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 otherwise indicated.
2. SSPC-SP 6, "Commercial Blast Cleaning" for surfaces indicated to receive intumescent coating.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Apply and extra coat of paint at corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
3. Apply primer on surfaces indicated to receive intumescent coating to produce dry film thickness (DFT) of 2.0 to 5.0 mils.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent holes and grind smooth after galvanizing.
2. Galvanize the following:
    a. Structural steel exposed to the exterior.
    b. Structural steel embedded in exterior walls that is, beams and columns exposed to the exterior face of wall backup.
    c. Shelf angles located in exterior walls.
    d. Lintels located in exterior walls, including entire lintel assembly.

PART 3 - -EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
   1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
   2. Plate washers shall be 1/16 inch diameter larger than anchor bolt and weld plate washers to top of base plate. Washers shall fully cover hole.
   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 base or bearing plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and base or bearing 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. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. 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.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated or as acceptable to Architect.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Remove markings from architecturally exposed structural steel before application of finish paint.

H. Do not use thermal cutting during erection.

I. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD ASSEMBLY

A. Erection bolts used in welded construction may be both tightened securely and left in place or removed and the holes filled with plug welds.

B. Poor matching of holes shall be corrected by drilling to next larger size. Welding for redrilling will not be permitted.

C. Galvanized steel shall not be field welded.

3.5 FIELD 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.
2. Slip critical fully tension tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
    a. Grind butt welds flush.
    b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds

C. Shear Connections:
1. Shear connections shall be field welded to beams in composite construction. Shear connectors shall be equally spaced as indicated on the drawings.
2. Headed stud-type shear connectors shall be automatically end welded in accordance with the headed stud manufacture’s printed recommendations and by personnel familiar with the installation equipment and procedures.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage and pay a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections. The inspector shall be a AISC certified and AWS certified welding inspector (CWI) in conformance with the provisions of AWS QC1, standard for AWS certification of welding inspectors.

B. 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." Inspector shall observe that proper calibration procedures are followed for tension measuring devices used for slip critical bolts and bolts used in direct tension. He shall also verify that proper bolt installation procedures are followed in accordance with RCSC Standards.

C. Welded Connections: Shop and field welds will be visually inspected according to AWS D1.1.
1. In addition to visual inspection, full and partial penetration welds and 10 percent of shop and field welds, shall be tested according to AWS D1.1 with one of the following inspection procedures, at the testing agency's option:
a Liquid Penetrant Inspection: ASTM E 165.
a. 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.
b. Ultrasonic Inspection: ASTM E 164.
c. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.7 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touch-up Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 05 1200

SECTION 05 3100 - STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Roof deck.

B. Related Sections include the following:
   1. Division 05 Section "Structural Steel": Shop-welded shear connectors.
   2. Division 05 Section "Metal Fabrications": Framing deck openings with miscellaneous steel shapes.
   3. Division 07 Section "EPDM Membrane Roofing: Installing sound-absorbing insulation strips in topside ribs of acoustical deck.

1.2 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Product Test Reports: From a qualified testing agency indicating that mechanical comply with requirements, based on comprehensive testing of current products.

F. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

F. FMG Listing: Provide steel roof deck evaluated by FMG and listed in FMG's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

G. Source Limitations: Engage a single Installer for installation of roof deck and lightweight concrete roof insulation.

1.4 PRODUCT 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.

1.5 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 roofing Section to ensure protection of insulation strips against damage from effects of weather and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Manufacturers of Conventional Steel Deck: Subject to compliance with requirements, provide products by one of the following:
   1. Consolidated Systems, Inc., (CSI)
   2. Nucor Corp.; Vulcraft Div.
   3. Roof Deck, Inc., (RDI)
   4. Commercial Metals Company, (CMC)
   5. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
   1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.

2. Deck Profile: Type B.
3. Profile Depth: 1-1/2 inches and 3 inches, as indicated on Drawings.
4. Cellular Deck Profile: Type 3DR, deep rib, with unperforated bottom plate; 3 inch depth.
5. Design Uncoated-Steel Thickness: 18 gage: (0.0474 inch).
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped or interlocking seam at Contractor's option.

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. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. 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. 29 for overhang and slab depth.

H. Column Closures, End Closures, Z-Closures, Finish Strips and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

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. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2- inch minimum depth. For drains, cut holes in the field.

K. 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.

L. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

M. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, 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 decking 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.
1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.

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 decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, 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.

3.3 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, but not less than 1-1/2 inches long, and as follows:
1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of four welds per deck unit at each support. Space welds 6 inches apart, maximum.
3. Weld Washers: Install weld washers at each weld location.

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 18 inches, and as follows:
1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch-long welds.
3. **<Epic Metals Type EP & WP >**

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

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.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Division 7 roofing Section.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:
1. Shear connector stud welds will be visually inspected.
2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND 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 brushing, cleaning and repair painting of rust spots, welds, and abraded areas of exposed deck surfaces are included in Division 09 Section "Painting and Coatings."

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 3100

SECTION 05 5000 - METAL FABRICATIONS

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. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Slotted channel framing.
4. Metal ladders.
5. Metal floor plate and supports.
6. Structural-steel door frames.
7. Metal bollards.
8. Abrasive metal nosings treads and thresholds.
9. Loose bearing and leveling plates for applications where they are not specified in other Sections.
10. Miscellaneous fabricated training props:
    a. Burn Doors, Double Burn Doors, Shutters
    b. Removeable Panel and Components
    c. Cage Props
    d. Rappelling Tie-offs
    e. Mock Cabinets
    f. Burn Racks
    g. Miscellaneous Burn Accessories; Vents and Scuppers

B. Products furnished, but not installed, under this Section include the following:
1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:
1. Section 03 3000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipes sleeves, slotted channel inserts, wedge type inserts, and other items cast into concrete.
2. Section 04 2000 "Unit Masonry" or Section 04 2200 "Concrete Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.3 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders - Fixed - Safety Requirements.

B. ASTM A27/A27M - Standard Specification for Steel Castings, Carbon, for General Application.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.

E. ASTM A48/A48M - Standard Specification for Gray Iron Castings.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

H. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

I. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

J. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

K. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

L. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

M. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

N. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

O. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

P. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

R. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

S. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

T. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

U. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.

V. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

W. ASTM F594 - Standard Specification for Stainless Steel Nuts.

X. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

Y. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.

Z. ASTM F2329/F2329M - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

AA. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

BB. AWS D1.1/D1.1M - Structural Welding Code - Steel.

CC. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

DD. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel.

EE. MFMA-4 - Metal Framing Standards Publication.

FF. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals.

GG. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

HH. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:
1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.
5. Slotted channel framing.

6. Manufactured metal ladders.
7. Metal bollards.
8. Abrasive metal nosings treads and thresholds.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal ladders.
4. Metal floor plate and supports.
5. Structural-steel door frames.
6. Miscellaneous fabricated training props:
   a. Burn Doors, Double Burn Doors, Shutters
   b. Removeable Panel and Components
   c. Cage Props
   d. Rappelling Tie-offs
   e. Mock Cabinets
   f. Burn Racks
   g. Miscellaneous Burn Accessories; Vents and Scuppers
7. Miscellaneous steel trim including steel angle corner guards steel edgings and.
8. Metal bollards.
9. Loose steel lintels.

C. Delegated-Design Submittal: For ladders and fabricated Rappelling Tie-offs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research Reports: For post-installed anchors.

1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer registered in the jurisdiction of the project to design components and connections of architectural elements including, but not limited to, guardrails, handrails, metal stairs, ladders, fabricated rappelling props, and other miscellaneous appurtenances as indicated in the Contract Documents. Submit to the Architect/Engineer, for review, signed and sealed shop drawings prepared by the contractor's engineer.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.

D. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

E. Rolled-Stainless Steel Floor Plate: ASTM A793.

F. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

G. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.108-inch (2.8-mm) nominal thickness.
3. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33 (Grade 230); 0.0677-inch (1.7-mm) minimum thickness; unfinished.

I. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

J. Aluminum Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.

K. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless steel fasteners for fastening aluminum stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1) Group 2 (A4).

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. 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.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Fabricate seams and other connections of metal fabrications within, on, or used in conjunction with training buildings, structures, or props in a manner to exclude water. Provide weep holes where water may accumulate or water vapor/steam may be trapped.

I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

J. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

K. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
1. Fabricate units from slotted channel framing where indicated.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 METAL LADDERS

A. General:
1. Comply with ANSI A14.3.

B. Aluminum Ladders:
1. Basis of Design Product: Subject to compliance with requirements, provide Precision Ladders, LLC Aluminum Heavy Duty Fixed Vertical Ladder Model FLH Series or comparable product by another manufacturer.
2. Source Limitations: Obtain aluminum ladders form single source from singe manufacturer.
3. Capacity: Unit shall support a 1,500 lb loading without failure, and individual treads shall withstand a 3,000 lb loading without failure.
4. Performance Standards: Unit designed and manufactured to meet or exceed ANSI A14.3, OSHA 1910.23, OSHA 1910.28 and OSHA 1910.29.
5. Space siderails 24 inches apart unless otherwise indicated.
6. Siderails/stringers: Continuous extruded 6005-T5 aluminum tubing, not less than depth, width and thickness required to comply with performance requirements, loading, and support configuration, and attachment of components; minimum of 3 inch by 1 inch by 1/8 inch.
7. Rungs/Treads: Extruded 6005-T5 aluminum with deeply serrated top surface; not less than 2-1/4 inch by 3/4 inchby 1/4 inch.
    a. Fit rungs in centerline of siderails; fasten by welding or with stainless steel fasteners.
8. Ladder Mounting Brackets: Not less than depth, width and thickness required to comply with performance requirements, loading, and support configuration, and attachment of components; 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick aluminum angle.
9. Fall Arrest System: Complete system with rail, sleeves, and harness to limit any fall to 6-inches.
10. Walk-Thru:
    a. Handrails: 1-1/4 inch aluminum square tube with rounded edges.
    b. Side Rails: 42 inch side rail extensions for through ladder exits.
    c. Flared: 30 inches wide for ladders with fall arrest system.

11. Security Door: 0.125 inch 3003-H14 aluminum panel 84 inches tall with padlock provision. Pad lock provided by Owner.
12. Floor Brackets: Floor bracket at foot of each stringer, 3 by 2 by 1/4 inches.
13. Provide platforms as indicated fabricated from extruded aluminum planks supported by extruded aluminum framing. Limit openings in gratings to no more than 1/2 inch in least dimension.
14. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
15. Finish: Standard Mill finish on aluminum ladder components.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.9 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.
1. Cap bollards indicated with pre-manufactured concrete bollard cap. Basis of design product; Topgard Pipe Bollard Cap or similar product by another manufacturer.

B. Prime steel bollards with zinc-rich primer.

2.10 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. American Safety Tread Co., Inc.
    b. Balco, Inc.
    c. Barry Pattern & Foundry Co., Inc.
    d. ROSS TECHNOLOGY CORP.
    e. Safe-T-Metal Company, Inc.
    f. Wooster Products Inc
2. Source Limitations: Obtain units from a single source from single manufacturer.
3. Nosings: Cross-hatched units, 4 inches wide with 1/4 inch x 1 inch lip for casting into concrete.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units.

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

C. Prime plates with zinc-rich primer.

2.12 MISCELLANEOUS FABRICATED TRAINING PROPS

A. Unless otherwise indicated, fabricate units from steel angles, shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize steel angles, shapes, plates, and bars.

D. Commercial Anchors and Tie-Offs; Vault Anchor
1. Basis of Design Product: Subject to compliance with requirements, provide Super Anchor Safety Fall Protection Equipment Series CCMU; 1609-SX or comparbale product by another manufacturer.
2. Material: 316 Stainless Steel.
3. Provide backer plate as required for installation within CMU block.
4. Provide thtough bolt fasteners as required for thickness of CMU wall.

E. Wire Rope Fittings
1. Basis of Design Product: Subject to compliance with requirements, provide Crosby Wire Rope End Fittings Model G-416 or comparable product by another manufacturer.
2. Coordinate open spelter socket size with wire rope size and requirements.

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.14 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No.3, "Commercial Blast Cleaning."

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction with anchor bolts.

3.3 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
   1. Do not fill removable bollards with concrete.

B. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.
   1. Embed anchor bolts at least 4 inches in concrete.

C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

3.4 INSTALALTION OF NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

3.5 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 5000

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SECTION 05 5119 - METAL GRATING STAIRS

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. Industrial Class stairs with steel-grating treads.
2. Steel railings and guards attached to metal stairs.
3. Steel handrails attached to walls adjacent to metal stairs.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

G. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

H. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

L. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

M. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel.

O. NAAMM AMP 510 - Metal Stairs Manual.

P. NAAMM MBG 531 - Metal Bar Grating Manual.

1.4 COORDINATION

A. Coordinate installation of anchorages for metal stairs, railings, and guards.
1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

B. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

C. Schedule installation of railings and guards so wall attachments are made only to completed walls.
1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For metal grating stairs and the following:
1. Gratings.
2. Shop primer products.
3. Grout.

B. Shop Drawings:
1. Include plans, elevations, sections, details, and attachment to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Delegated-Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.
   1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
   2. Protect steel members and packaged materials from corrosion and deterioration.
   3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
      a. Repair or replace damaged materials or structures as directed.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design stairs, railings, and guards, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
   2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
   5. Limit deflection of treads, platforms, and framing members to L/360.

C. Structural Performance of Railings and Guards: See Section 05 5213 "Pipe and Tube Railings"

D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: As indicated within structural drawings.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

D. Steel Bars for Grating Treads: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

E. Steel Tubing for Railings and Guards: ASTM A500/A500M (cold formed).
   1. Provide galvanized finish for all installations.

F. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

G. Provide galvanized finish unless indicated otherwise.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
   1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be galvanized.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with ASTM A780/A780M and compatible with paints specified to be used over it.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs, railings, and guards in shop to greatest extent possible.
   1. Disassemble units only as necessary for shipping and handling limitations.

2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.
1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply 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. Weld exposed corners and seams continuously unless otherwise indicated.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.
3. Fabricate joints that are exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:
1. Fabricate stringers of steel channels.
   a. Stringer Size: As indicated on drawings unless larger members are required to comply with "Performance Requirements" Article.
   b. Provide closures for exposed ends of channel stringers.
   c. Finish: Galvanized.
2. Construct platforms and tread supports of steel channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
   a. Provide closures for exposed ends of channel framing.
   b. Finish: Galvanized.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from welded steel grating with 1-by-3/16-inch (25-by-5-mm) bearing bars at 11/16 inch o.c. and crossbars at 4 inches o.c.

D. Risers: Open.

E. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.
   1. Material and Finish: Steel plate to match finish of other steel items.

2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Comply with applicable requirements in Section 05 5213 "Pipe and Tube Railings."

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
   2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
   1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
   1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 5119

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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. Steel pipe and tube railings.
2. Section 05 5119 "Metal Grate Stairs" for steel tube railings associated with metal grate stairs.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

F. ASTM E894 - Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.

G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

H. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

I. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

J. ASTM F594 - Standard Specification for Stainless Steel Nuts.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel.

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural members."
   2. Copper Alloys: Use a safety factor of 1.65 applied to minimum yield strength of alloy, as published in CDA "Standard Handbook, Part 2 - Alloy Data, Wrought Copper Mill Products."

C. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on the following:
   1. Structural Computations
   2. Design Data: Engineered drawings of metal stairs and railings with seal of Professional Engineer registered in the state where project is located.

D. Structural Performance of Handrails and Railings Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
   1. Rail Loading:
      a. Cap Rail of Guardrail Systems and Wall Railings: Capable of withstanding the following loads:
         1) Concentrated load of 400 lbs/ft applied at any point in any direction.
         2) Uniform load of 100 lbs per linear foot applied in any direction and concurrently with uniform load of 200 lbs per linear foot applied vertically downward.
         3) Concentrated and uniform loads above need not be assumed to act concurrently.
      b. Handrails not serving as Cap Rails: Capable of withstanding the following loads applied as indicated:
         1) Concentrated load of 400 lbs per linear foot applied at any point in any direction.
         2) Uniform load of 100 lbs per linear foot applied in any direction.
         3) Concentrated and uniform loads above need not be assumed to act concurrently.
      c. Infill Area of Guardrails Systems: Capable of withstanding a horizontal concentrated load of 200 lbs applied to 1 sq. ft. at any point in the system including panels, intermediate rails, balusters, or other elements composing th infill area.
         1) Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress guard.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

F. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 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 Verification: 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 finishing & connecting members at intersections.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.9 COORDINATION AND SCHEDULING

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.

PART 2 PRODUCTS

2.1 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.

2.2 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed).

B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.3 FASTENERS

A. General: Provide the following:
1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F 2329 for zinc coating.

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 Phillips tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F 738M), and nuts, ASTM F594 (ASTM F 836M).

2.4 STEEL RAILING SYSTEM

A. Rails:
   1. Extra heavy weight 2 3/8 inches O.D. steel pipe, welded jointing; locations as indicated on drawings.
   2. Extra heavy weight 1 1/2 inches O.D. steel pipe welded jointing; locations as indicated on drawings.

B. Posts:
   1. Extra heavy weight 2 3/8 inches O.D. steel pipe, welded jointing; locations as indicated on drawings.
   2. Extra heavy weight 1 1/2 inches O.D. steel pipe welded jointing; locations as indicated on drawings.

C. Fitting: Elbows, Tees, wall brackets, escutcheons; machined steel

D. Mounting: Brackets and flanges, with steel inserts for casting in concrete with steel brackets for embedding in masonry or concrete.

E. Splice Connectors: Steel welding collars.

F. Brackets: Wall handle rail equal to Julius Blum and Co. malleable iron No. 306 or approved equivalent.

G. Hot Dipped galvanizing : 1.25 oz/sq. ft. zonc coating in accordance with ASTM A386

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings 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."

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. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 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. Assemble railings in the shop 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 will be exposed to weather in a manner to exclude 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. Form changes in direction as follows:
   1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. 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.

M. 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.

N. 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.

O. For railing posts set in concrete, provide 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.

P. For removable railing posts, fabricate slip-fit sockets from 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.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:
1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

PART 3 EXECUTION

3.1 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 have been 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. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

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.

3.2 RAILING CONNECTIONS

A. 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.

B. 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.

3.3 ANCHORING POSTS

A. 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.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

C. 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 steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing endsor connected to railing ends using nonwelded connections.

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. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. 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.

3.5 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.6 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

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SECTION 05 5313 - BAR GRATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal bar gratings.
2. Grating frames and supports.

B. Related Requirements:
1. Section 05 5119 "Metal Grating Stairs" for grating treads and landings of steel-framed stairs.
2. Section 05 5213 "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

1.2 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

F. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

G. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

H. ASTM F594 - Standard Specification for Stainless Steel Nuts.

I. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel.

K. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

L. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

M. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel.

N. NAAMM MBG 531 - Metal Bar Grating Manual.

O. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.

P. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals.

Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.3 ACTION SUBMITTALS

A. Product Data:
1. Metal bar gratings.
2. Clips and anchorage devices for gratings.

B. Shop Drawings:
1. Include plans, sections, and attachment details.
2. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Delegated Design Submittals: For gratings, including manufacturers' published load tables analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: 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.

B. Certificates:
1. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.
2. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
3. Welding certificates.

C. Delegated design engineer qualifications.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Delegated Design Engineer: A professional engineer who is legally qualified to practice in the jursidiction where Project is located and who is experienced in providing engineering services of the type indicated.
2. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
   a. AWS D1.1/D1.1M.
   b. AWS D1.2/D1.2M.
   c. AWS D1.3/D1.3M.
   d. AWS D1.6/D1.6M.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installtin acnhorages, 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.

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. All American Grating.
2. Grating Pacific, Inc.
3. Ohio Gratings, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design gratings.

B. Structural Performance: Gratings to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Floors for Light Manufacturing: Uniform load of 125 lbf/sq. ft. (6.00 kN/sq. m) or concentrated load of 2000 lbf (8.90 kN), whichever produces the greater stress.
2. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m).
3. Walkways and Elevated Platforms: Uniform load of 100lbf/sq. ft..
4. Limit deflection to L/360 or 1/4 inch, whichever is less.

2.3 METAL BAR GRATINGS

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531 and NAAMM MBG 532.

B. Welded Steel Grating:
1. Bearing Bar Spacing: 1-3/16 inches o.c.
2. Bearing Bar Depth: 1-1/2 inch.
3. Bearing Bar Thickness: 3/16 inch.
4. Crossbar Spacing: 2 inches o.c.
5. Traffic Surface: Plain.
6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. (550 g/sq. m) of coated surface.

2.4 GRATING FRAMES AND SUPPORTS

A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
   1. Unless otherwise indicated, fabricate from same basic metal as gratings.
   2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

B. Galvanize steel frames and supports in the following locations:
   1. Exterior.
   2. Interior.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for both interior and exterior use where gratings are used within, or or in conjunction with training buildings, structures, and/or props.

B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, nuts, and, where indicated, flat washers; ASTM F593 (ISO 3506-1) for bolts and ASTM F594 (ASTM F836M) for nuts, Alloy Group 1 (A1) Group 2 (A4).

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M), and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

2.6 MISCELLANEOUS MATERIALS

A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.7 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Bars for Bar Gratings: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

2.8 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use

connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material 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.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and 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.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
2. Fabricate toeplates for attaching in the field.
3. Toeplate Height: 4 inches unless otherwise indicated.

G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
2. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
3. Provide no fewer than four weld lugs for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced less than 15/16 inch o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
4. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
5. Furnish threaded bolts with nuts and washers for securing grating to supports.

H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

I. Do not notch bearing bars at supports to maintain elevation.

2.9 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Attach toeplates to gratings by welding at locations indicated.

F. Field Welding: Comply with AWS recommendations and 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.

G. Corrosion Protection: With a heavy coat of bituminous paint, coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals.

3.2 INSTALLATION OF METAL BAR GRATINGS

A. Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 REPAIR

A. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on prime-painted gratings immediately after installation, and apply repair paint with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
   a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
2. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 09 9600 "High Performance Coatings".

B. Repair of Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 5313

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SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preservative treated wood materials.

B. Plywood mounting boards (backing panels.)

C. Concealed wood blocking, nailers, and supports.

D. Miscellaneous wood nailers, furring, and grounds.

E. Miscellaneous wood sheathing; Wall and roof.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

C. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

D. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.

E. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry.

F. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

G. AWPA U1 - Use Category System: User Specification for Treated Wood.

H. PS 1 - Structural Plywood.

I. PS 20 - American Softwood Lumber Standard.

1.3 DEFINITIONS

A. Boards and Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimensional Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data for wood preservative materials and application instructions from chemical treatment manufacturer and certification by treatment plant that treatment materials comply with requirements. Indicate type of treatment used and net amount of treatment retained.

C. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Power-driven fasteners.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species:
      a. Spruce-Pine-Fir (South)
      b. Hem-Fir (North)
      c. Douglas Fir (South)
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
   5. Factory mark each piece of lumber with grade stamp of grading agency.
   6. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements.

C. Lumber salvaged from deconstruction or demolition of existing buildings or structures is permitted in lieu of sustainably harvested lumber provided it is clean, denailed, and free of paint and finish materials, and other contamination; identify source.

D. Lumber fabricated from recovered timber is permitted in lieu of sustainably harvested lumber, unless otherwise noted, provided it meets the specified requirements for new lumber and is free of contamination; identify source.

2.2 DIMENSION LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including but not limited to blocking, nailers, grounds, furring, sleepers, plates, cants, and curbs.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: Kiln-dry or MC15.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, Sleeper, Plates Cants, Curbs, and Furring:
1. Lumber: S4S, No.2 or Standard Grade.
2. Boards and Strips: Standard or No.3.

E. 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.

F. 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.

G. For rurring strips fo rinstalling plywood or hardboard paneling , select boards with no knots capable of producing bent-over nails and damage to paneling.

2.3 CONSTRUCTION PANELS

A. Plywood Panels: Plywood, PS 1, Grade C-D, Exposure I.

2.4 ACCESSORIES

A. Fasteners and Anchors, General: Provide faseners of size and type that comply with requirements specified in this article for material and manufacture.
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Nails, Brads, and Staples: ASTM F1667/F1667M.

C. Screws for Fastening to Metal Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.
1. Screw length shall be of sufficient length to penetrate and secure multiple plies to metal framing and not be secured by previous ply or substrate.

D. Power Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an avaulation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ESAC308 as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

F. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

2.5 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Application: Treat all miscellaneous carpentry unless otherwise indicated.
      a. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A.
         1) Kiln dry lumber after treatment to maximum moisture content of 19 percent.
         2) Treat lumber exposed to weather.
         3) Treat lumber in connection with roofing, flashing, or waterproofing.
         4) Treat lumber in contact with masonry or concrete.
         5) Treat lumber less than 18 inches above grade.
         6) Treat lumber in other locations as indicated.
      b. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F.
         1) Kiln dry plywood after treatment to maximum moisture content of 19 percent.
         2) Treat plywood in connection with roofing, flashing, or waterproofing.
         3) Treat plywood in contact with masonry or concrete.
         4) Treat plywood less than 18 inches above grade.
         5) Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Set Carpentry to required levels and lines, with mebers plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailes blocking and similar supports to comply with requirements for attaching other construction.

B. Select material sizes to minimize waste.

C. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

D. Do not splice structural members between supports unless otherwise indicated.

E. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

F. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1 "Fastening Schedule" in ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.

H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

I. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.2 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. Provide metal clips fpr fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches on center.

C. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

D. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

E. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

F. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Miscellaneous Wall and Roof Sheathing
   1. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
      a. Install plywood wall sheathing in accordance with manufacturer's current ICC-ES evaluation report for specified sheathing product.

B. Plywood Mounting Boards (Backing Panels): Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.4 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.5 CLEANING

A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 1053

SECTION 07 1113 - BITUMINOUS DAMPPROOFING

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. Cold-applied, emulsified-asphalt dampproofing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.

B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. APOC, Inc.; a division of Gardner-Gibson.
2. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
3. Euclid Chemical Company (The); an RPM company.

B. Trowel Coats: ASTM D 1227, Type II, Class 1.

C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
   1. Apply dampproofing to provide continuous plane of protection.
   2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
   1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
   1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
   2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations and Parged Masonry Foundation Walls: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.

B. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. (0.6 L/sq. m) for first coat and 1 gal./100 sq. ft. (0.4 L/sq. m) for second coat.

C. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

D. Unexposed Face of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

E. Concrete Backup for Brick Veneer Assemblies: Apply one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

F. Masonry Backup for Brick Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

G. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.5 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 1113

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SECTION 07 1800 - TRAFFIC COATINGS

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 traffic coatings and pavement markings for the following applications:
   1. Pedestrian traffic.

1.3 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.

D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product, including installation instructions.

B. Shop Drawings: For traffic coatings.
   1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
   2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples for Initial Selection: For each type of exposed finish.

D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.
   1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
1. Certification: Written approval or license of applicator by traffic coating manufacturer.

B. Mockups: Build mockups to set quality standards for materials and execution.
1. Build mockup for each traffic coating and substrate to receive traffic coatings.
2. Size: 36 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 degrees Fahrenheit, when relative humidity exceeds 85 percent, or when temperatures are less than 5 degrees Fahrenheit above dew point.
1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations:
1. Obtain traffic coatings from single source from single manufacturer.

2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for pedestrian traffic; according to ASTM C 957.
1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:
a. Carlisle Coatings & Waterproofing Inc.; CCW-5123
b. IMCO Technologies, Inc.; Jetset 100
c. Neogard; Division of Jones-Blair.; Auto-Gard F
d. Sherwin-Williams; Resudeck.
e. Sonneborn, Div. of Chem Rex, Inc.; Sonoguard Heavy Duty Traffic

B. Primer: Liquid waterborne or solvent-borne primer recommended for substrate and conditions by traffic coating manufacturer and that complies with the requirements of the authority having jurisdiction.
1. Material: Urethane

C. Preparatory and Base Coats: Aromatic urethane.
1. Thicknesses: Minimum dry film thickness as recommended in writing by manufacturer for substrate and service conditions indicated.

D. Intermediate Coat: Aromatic urethane.
1. Thicknesses: Minimum dry film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.

E. Topcoat: Aromatic urethane with UV inhibitors.
1. Thicknesses: Minimum dry film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.
2. Aggregate Content: 8 to 10 lb/100 sq. ft. (3.6 to 4.5 kg/10 sq. m).
3. Color: As selected by Architect from manufacturer's full range.

F. Aggregate: Manufacturer's standard aggregate for each use indicated Uniformly graded, washed silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.

G. Low-Emitting Materials: Traffic coating 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."

2.3 ACCESSORY MATERIALS

A. Joint Sealants: ASTM C920.

B. Sheet Flashing: Nonstaining , uncured neoprene sheet.
1. Thickness: Minimum 60 mils 0.06 inch.

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.
1. Test for moisture content by method recommended in writing by traffic-coating manufacturer.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.

D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.

3.2 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.

B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D4259. Do not acid etch.
1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
2. Remove concrete fins, ridges, and other projections.
3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.

4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D4258.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.
1. Comply with recommendations in ASTM C1193 for joint-sealant installation.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.

B. Start traffic-coating application in presence of manufacturer's technical representative.

C. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft. (9 sq. m).

D. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

E. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

F. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform the following field tests and inspections:
1. Materials Testing:
   a. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Owner and Contractor.
   b. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.

c. Testing agency shall verify thickness of coatings during traffic-coating application (56 sq. m).

2. If test results show traffic coating does not comply with requirements, remove and replace or repair the membrane as recommended in writing by traffic-coating manufacturer and make further repairs after retesting until traffic-coating installation passes.

B. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 1800

SECTION 07 1900 - WATER REPELLENTS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete.

B. ASTM G154 - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section includes penetrating clear film-forming MPI-approved water-repellent treatments for the following vertical and non-traffic horizontal surfaces:
1. Cast-in-place concrete.
2. Concrete unit masonry.

B. Related Sections:
1. Section 04 2000 "Unit Masonry" or Section 04 2200 "Concrete Unit Masonry" for integral water-repellent admixture for unit masonry assemblies.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.

B. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours in comparison of treated and untreated specimens.
1. Cast-in Place Concrete: ASTM C642.
2. Concrete Masonry Units: ASTM C 140.

C. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, according to ASTM E 514.

D. Durability: Maximum 5 percent loss of water-repellent properties after 2500 hours of weathering according to ASTM G154 in comparison to water-repellent-treated specimens before weathering.

E. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.
1. Reduction of Water Absorption: 80 percent.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
1. Include manufacturer's printed statement of VOC content.
2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches (300 by 300 mm) in size, with specified water-repellent treatment applied to half of each Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Preconstruction Testing Reports: For water-repellent-treated substrates.

B. Warranty: Special warranty specified in this Section.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

B. Mockups: Apply water repellent to each type of substrate required.
1. Locate each test application as directed by Architect.
2. Size: 10 sq. ft. (9.3 sq. m).
3. Final approval by Architect of water-repellent application will be from test applications.

C. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
1. Concrete surfaces and mortar have cured for not less than 28 days.
2. Building has been closed in for not less than 30 days before treating wall assemblies.
3. Ambient temperature is above 40 degrees Fahrenheit and below 100 degrees Fahrenheit and will remain so for 24 hours.
4. Substrate is not frozen and substrate-surface temperature is above 40 degrees Fahrenheit and below 100 degrees Fahrenheit.
5. Rain or snow is not predicted within 24 hours.
6. Not less than 24 hours have passed since surfaces were last wet.
7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which Applicator agree(s) to repair or replace materials that fail to maintain water repellency due to materials and/or workmanship as specified within specified warranty period. Warranty does not include deterioration or failure of coating due to unusual

weather phenomena, failure of prepared and treated substrates, and new substrate cracks in excess of 1/16 inch wide, fire, vandalism, or abuse by maintenance equipment.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PENETRATING WATER REPELLENTS

A. Proprietary-Blend, Penetrating Water Repellent: Clear, consisting of one or several different resins (silanes or siloxanes or acrylics), polymers, stearates, or oils plus other compounds or products of components; and with 400 g/L or less of VOCs.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Evonik Industries; Protectosil CHEM-TRETE PB VOC
    b. BASF Construction Chemicals, LLC; Enviroseal 20.
    c. PROSOCO, Inc.; Weatherseal H40Stain Barrier.
    d. Diedrich Technologies inc.; Diedrich 303 WB
    e. Sonneborn Building Products; White Roc 10 WB
    f. Euclid Chemical; Chemstop WB Heavy Duty

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in number of representative locations recommended by manufacturer and by method recommended by manufacturer.
2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
4. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:

1. Cast-in-Place Concrete and Concrete Unit Masonry: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents .

B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

C. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

D. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
   1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using 15 psi- (15 psi-) pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.
   1. Precast Concrete: At Contractor's option, first application of water repellent on units may be completed before installing them. Mask mortar and sealant bond surfaces to prevent water repellent from migrating onto joint surfaces.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 1900

SECTION 07 4113.16 - STANDING-SEAM METAL ROOF PANELS

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. Standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Meet with CMa, Architect, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
   1. Basis of Design Product: Subject to compliance with requirements, provide ATAS 2" Field Lok Double Seam standing seam metal roofing system or comparable product by another manufacturer.
      a. Contractor shall verify seam height with existing adjacent roof and provide panel product matching existing roofing.
   2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
      a. Nominal Thickness: 0.028 inch (0.71 mm) .
      b. Exterior Finish: Two-coat fluoropolymer.
      c. Color: As selected by Architect from manufacturer's full range.
   3. Clips: Two-piece floating to accommodate thermal movement.
      a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
      b. Clips shall be high to provide air space between sheeting and panel.
   4. Joint Type: As standard with manufacturer.
   5. Panel Coverage: To match existing adjacent standing seam metal roofing panels (406 mm).
   6. Panel Height: 2.0 inches (51 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, vapor permeable, water tight, air barrier, sheet underlayment, consisting of spun bound polyester fabric, vapor permeable polymer composite technology, slip resistant, UV-stable, top coating with siliconized release-film backing.
   1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
   2. Low-temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970
   3. Thickness: 20 mil
   4. Primer: Non-required
   5. UV/Climate Exposure: Not less than 180 days.
   6. High Drying Capacity: 30 perms
   7. Air Infilitration: None; ASTM E2178
   8. VOC's: zero.
   9. Basis of Design Product: Subject to compliance with requirements, provide VaproShield SLOPESHIELD (SA) or comparable product by another manufacturer.

2.4 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels roof fascia and rake trim.

D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

E. Panel Fasteners: Self-tapping screws designed to withstand design loads.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
   2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:
   1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
   2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
   1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
   2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
1. Apply over the entire roof surface.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3.4 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
   1. Install clips to supports with self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
   4. Watertight Installation:
      a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
      b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
      c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed 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 weather resistant.
   1. Install exposed flashing and trim that is without 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 achieve waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
   1. Provide elbows at base of downspouts to direct water away from building.
   2. Connect downspouts to underground drainage system indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 4113.16

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SECTION 07 7000 - THERMAL LINING SYSTEM

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 requirements for the thermal lining system.

B. The thermal lining system shall include the following minimum components to make up the System:
1. A 1 inch thick layer of calcium silicate insulation with a maximum density of 18 pounds per cubic foot, and a continuous service temperature rating of a minimum of 1800 degrees Fahrenheit. Material shall have minimum compressive strength of 450 psi and minimum flexural strength of 260 psi. Material shall have maximum shrinkage of 1% in length and width when subjected to continuous temperature of minimum 1700 degrees Fahrenheit for 24 hours. Material shall have maximum “k” value of .73 at 800 degrees Fahrenheit. Materials shall be free of asbestos or any other toxic substances.
2. The insulation shall be fully covered with refractory concrete fire castings. Casting dimensions shall be 12” x 12” x 1 ¾” thick.
3. Castings shall interlock with one another, in a fashion that ensures shedding of water from fire hose streams, preventing water from reaching the insulation barrier. Each casting shall be anchored to the structure with one stainless steel anchor per 7000.1.2.B.3. Castings shall be designed to allow the installed system to immediately expand and contract with extreme fluctuations in temperatures associated with live fire training conducted in accordance with NFPA 1403, latest edition. Castings shall endure thermal shock associated with fire suppression using fire hose streams. The system shall include special shapes to deal with different conditions, such as corner conditions. Corners that are subject to abuse from equipment shall be bullnose corner castings or cast-in-place refractory material creating a chamfer, as indicated in the contract documents. Every casting in the completed System shall interlock with adjacent castings, providing an impenetrable, floating barrier of refractory concrete which completely covers and protects the insulation barrier. Ceiling and wall panels and all corners shall also interlock. Special castings shall be provided to accommodate temperature monitoring devices, conduit and wiring as indicated in the contract documents. Casting material shall have a density of 140 to 150 pounds per cubic foot. Material shall have a cold crushing strength of 10000 psi after exposure to 2000 degrees. Material shall be designed to expel any absorbed water without cracking or spalling when exposed to temperatures up to 2000 degrees Fahrenheit.
4. Each casting in the System shall be anchored to the structure with a minimum of one grade 304 stainless steel anchor.
    a. For concrete substrates - use a 304 stainless steel wedge anchor, 3/8” in diameter with a minimum embedment of 2” or per manufacturer’s recommendations, whichever is greater. Anchors shall have pullout ratings as follows:
        1) Ultimate in 2000 psi concrete shall be minimum 1631 pounds.
        2) Allowable load with 4:1 safety factor shall be minimum 407 pounds.

b. For hollow concrete masonry substrates - use a 304 stainless steel sleeve anchor, 3/8" in diameter with a minimum embedment of 1 1/4" or per manufacturer's recommendations, whichever is greater. Anchors shall have pullout ratings as follows:
   1) Ultimate in 2000 psi concrete shall be minimum 1800 pounds.
   2) Allowable load with 4:1 safety factor shall be minimum 450 pounds.

5. All walls included in the System shall be provided with a base course of mortared in place fire brick as indicated by the contract documents. Fire brick shall be a minimum of 4 ½" x 9" x 2 ½" thick medium duty fire brick, set in type N mortar. Brick shall meet ASTM C27-84.
6. The System shall include stainless steel and aluminum flashings as indicated in the contract documents. Stainless steel flashings shall be Grade 304 stainless steel and have a minimum thickness of .018". Aluminum flashings shall have a minimum thickness of .032".
7. The System shall include refractory packings as indicated in the contract documents. Packing mix shall be a general purpose castable for use to temperatures to 2000°F. The mix shall have good resistance to abrasion, a low iron content, and no more than 0.5% shrinkage when exposed to 2000 degrees Fahrenheit. Mix shall have a minimum cold crushing strength of 1400 psi after exposure to 2000 degrees Fahrenheit.

1.3 PERFORMANCE REQUIREMENTS FOR THERMAL LINING SYSTEM

A. Thermal lining system shall provide thermal protection for the structural components from temperatures attained during fire training.
   1. Thermal lining system shall withstand temperatures at the exposed face of thermal lining of up to 2,000 F.
   2. Temperature behind thermal lining system during live fire training, at the face of the protected structure, shall not exceed 350 F when the room temperature at the exposed face of the thermal lining system is 2,000 degrees F.
   3. During a live fire training day, multiple live fire training evolutions may occur. After each evolution, the fire may be left smoldering, but not completely extinguished. At the beginning of the next evolution, the fire is reignited. This cycle typically repeats all day during a training day. As a result, significant residual heat builds up in the building by the last training evolution. The thermal lining system shall withstand, without damage, residual heat buildup created by a minimum of 20 consecutive live fire training evolutions.

B. Thermal lining system shall withstand, without damage, repetitive thermal shock created by rapid cooling of heated surfaces with cool water from water mains. Thermal lining system shall allow for expansion and contraction caused by rapid heating and cooling.

C. Thermal lining system shall withstand, without damage, impact loads and other associated stresses induced by pressurized water sprayed from hoses (300 gallons per minute, 100 pounds per square inch of pressure) and thermally pressurized steam.
   1. Thermal lining system shall prevent water and steam penetration to the protected structure.
   2. Thermal lining system shall allow for the fact that almost all cementitious materials will absorb water through direct water application or through condensation caused by large fluctuations in temperature, such as those commonly experienced during winter months. Once this absorbed water is abruptly heated during a fire, it will convert to pressurized steam which could act to degrade the lining material. The thermal lining system shall be designed to expel such water and vapor that could penetrate the system. The thermal lining system must be functional in all seasons of the year.

D. Thermal lining system shall withstand, without damage, routine physical abuse during typical live fire training evolutions, including, but not limited to:
   1. impact of fire fighters' protective clothing, self-contained breathing apparatuses, or hand tools
   2. impact of wood pallets or other Class A fuel materials "tossed" onto the fire and impacting the thermal lining system.

E. Thermal lining system shall be functional year-round, withstanding the effects of seasonal weather considerations, including seasonal temperature changes, freeze/thaw cycles, humidity, and precipitation.

F. Thermal lining system shall withstand, without damage, the effects of oxygen deficient atmosphere.

G. Thermal lining system shall allow for the use of surface and subsurface mounted thermocouples that penetrate the lining.

H. Thermal lining system shall be free from asbestos or other harmful ingredients, and shall not produce toxic byproducts during live fire training.

I. Thermal lining system properties shall not degrade under repeated use.

J. Thermal lining system shall be capable of bracing tops of walls against lateral, out-of-plane movement, as shown on the drawings; or thermal lining system fabricator shall propose an acceptable, alternate method for bracing tops of walls against lateral, out-of-plane movement while maintaining continuous thermal protection for the protected structural elements. Out of plane wind loads are stated on drawings.

1.4 QUALIFICATION PROCEDURE

A. For any prospective thermal lining system fabricator/supplier/product that is not listed under Section 2, submit a written request for qualification to the Engineer. For all requests for qualification, include the information defined in the following sections and deliver to the Engineer 14 calendar days before the stated date of bid opening as identified in the solicitation documents. Lack of adequate information is sufficient cause for rejection. References to catalogs or other descriptive documents not included with the application for qualification to the Architect are not acceptable.

B. QUALIFICATIONS
   a. Fabricator’s Qualifications: Provide the following information:
      1) Corporate qualifications and capabilities that fully describe the ability to fabricate the required thermal lining system.
      2) A history of experience manufacturing thermal linings in live fire training structures ("burn buildings").
      3) A list of ten (10) completed projects in excess of 1000 sq feet, at least five (5) of which shall be more than ten (10) years old, illustrating thermal lining system performance equal or greater to the performance criteria listed in this specification. Include the award date, the completion date, the contract value, and the name and telephone number of a person employed by the Owner who has personal knowledge of the thermal lining performance. Also provide descriptions of any testing that has been performed on the product to indicate that it will have performance equal or greater to the performance criteria listed in this specification.
   b. Installer’s Qualifications: Provide the following information:
      1) Qualifications and capabilities that fully describe the ability to install the required thermal lining system.

2) A history of experience installing thermal linings in live fire training structures ("burn buildings").
3) A list of ten (10) completed projects in excess of 1000 sq feet, at least five (5) of which shall be more than five (5) years old. Include the award date, the completion date, the contract value, and the name and telephone number of a person employed by the Owner who has personal knowledge of the thermal lining performance.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the General Conditions of the Contract and Division 1 Specification Sections.

B. Evidence of installer qualifications, including certification by thermal lining system fabricator.

C. Certificate of Conformance: Fabricator's certification that materials and equipment are physically and chemically compatible with each other, that materials are in compliance with performance requirements of this specification, and that each material and/or equipment is suitable for the intended purpose. Materials and equipment not listed in the certificate will not be permitted in the work area. Submit Material Safety Data Sheets (MSDS) for the thermal lining system.

D. Materials Certification: Letter from the fabricator certifying that materials shipped meet fabricator's specification data.

E. Samples of materials to be used, including thermal tile, insulation, and anchoring system.

F. Shop drawings detailing fabrication and erection of thermal lining system. Include plans, elevations, sections, and details of thermal lining system and connections to substrates. Show anchorage and accessory items.

1.6 QUALITY ASSURANCE

A. All thermal lining systems shall be provided by one fabricator.

B. Installer Qualifications: Thermal lining system shall be installed by fabricator or by a contractor approved by the fabricator and under the supervision of the fabricator.

C. Warranties:
1. The fabricator shall furnish a five year warranty for the thermal lining system, starting from the date of Owner's acceptance of the Work, to cover replacement of all defective materials found within the term of the warranty.
2. The installer shall furnish a one year warranty, starting from the date of Owner's acceptance of the Work, to cover replacement of all materials found to be defective due to workmanship during the term of the warranty.
3. Warranties can be limited to replacement of defective materials, including labor, as required resulting from thermal lining system components or performance. Warranties can exclude repairs, replacement, and corrective work to the substrate, structure, and/or property. Warranties can exclude mechanical damage due to abuse or neglect, structural failure, or forces of nature greater than normal weather conditions.
4. Substrate shall be monolithic, without joints, holes, penetrations, or embedded items that pass through the entire thickness that could cause moisture to pass through the substrate into the thermal

lining system, except for joints and items shown on the drawings. Warranty can exclude damage to the lining system and substrate caused by moisture penetration through the joints, holes, penetrations, and embedded items in the substrate that are not shown on the drawings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and protect materials from damage and weather in accordance with the fabricator's instructions. Keep materials clean and dry at all times.

B. Handle materials in accordance with fabricator's recommendations.

PART 2 - PRODUCTS

2.1 THERMAL LINING SYSTEM

A. Basis of Design Product: Subject to compliance with requirements, provide High Temperature Linings; System 203 thermal lining system or comparable product by another manufacturer. System shall include all components fasteners and other accessories for the installation of a complete and functional system.
1. BOD Contact Information: High Temperature Linings, P. O. Box 1240, White Stone, Virginia 22578; Phone (800) 411-6313, www.firetrain.com.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean all surfaces to receive thermal lining system of oils, dust, and other deleterious matter. Install thermal lining system over dry surfaces.

3.2 INSTALLATION

A. Install thermal lining system and all accessories in accordance with the fabricator's requirements.

3.3 CLEAN UP

A. Remove all debris, scraps, containers, and any other trash resulting from the installation of the thermal lining system.

END OF SECTION 07 7000

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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. Section Includes:
1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below:
    a. Control and expansion joints in unit masonry.
    b. Joints between materials
    c. Perimeter joints between materials and frames of doors and windows.
    d. Other joints as indicated.
2. Exterior joints in horizontal traffic surfaces as indicated below:
    a. Control, expansion and isolation joints in cast-in-place concrete slabs.
    b. Joints between different materials
    c. Other joints as indicated
3. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
    a. Control, expansion joints on exposed interior surfaces of exterior walls
    b. Perimeter joints of exterior openings where indicated.
    c. Joints between tops of non-load bearing unit masonry and concrete walls and partitions.
    d. Tile control and expansion joints
    e. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    f. Perimeter joints between interior wall surfaces and frames of interior doors and windows.

1.3 DEFINITIONS

A. Joint Sealants- caulk, caulking or joint sealers are synonomous and mean joint sealants as herein described.

B. Exterior- joints at exterior surfaces of the building, whether or not directly exposed to the weather.

C. Interior- joints at interior surfaces of the building but not exposed to the weather in any manner.

D. Paving- Joints in floor slabs, sidewalks, steps, ramps, and curbs.

E. SYSTEM PERFORMANCE REQUIREMENTS
1. Provide elastomeric joint sealants that have been produced and installed to establish and maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

2. Provide joint sealants for interior applications that have been produced ans installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

F. Related Sections:
1. Section 04 2000 "Unit Masonry" or Section 04 2200 "Concrete Unit Masonry" for masonry control and expansion joint fillers and gaskets.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM C834 - Standard Specification for Latex Sealants.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants.

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

G. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.5 PRECONSTRUCTION TESTING

A. 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 manufacturer's standard test method 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 eight pieces of each kind 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 use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

a. Each kind of sealant and joint substrate indicated.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
   a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind 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.

1.6 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.7 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
1. Certification by joint sealant manufacturer that sealants manufacturer that sealants plus primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.
2. Certificates from the manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for use indicated.

B. Material Safety Data Sheets: indicating that the VOC levels of the products provided under this Section do not exceed the specified allowable levels.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction 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.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.9 PROJECT CONDITIONS

A. 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 or are below 40 degrees Fahrenheit.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.10 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: 5 years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   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 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 joint-sealant manufacturer, based on testing and field experience.

B. Colors: Joint sealant colors shall be chosen by Architect from manufacturer's full range of colors. Multiple sealant colors may be chosen by Architect to achieve aesthetic value. Vertical or horizontal joints may consist of multiple sealant colors transitioning at differing materials.

C. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 795.
      b. GE Advanced Materials - Silicones; UltraPruf II SCS2900.
      c. Pecora Corporation; 895.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 790.
      b. May National Associates, Inc.; Bondaflex Sil 728 NS.
      c. Pecora Corporation; 311 NS.
      d. Tremco Incorporated; Spectrem 800.

C. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 786 Mildew Resistant.
b. GE Advanced Materials - Silicones; Sanitary SCS1700.
c. Tremco Incorporated; Tremsil 200 Sanitary.

2.3 URETHANE JOINT SEALANTS

A. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.
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. BASF Building Systems; Sonolastic NP 2.
b. Pecora Corporation; Dynatred.
c. Tremco Incorporated; Vulkem 227.

2.4 POLYSULFIDE JOINT SEALANTS

A. Immersible, Multicomponent Nonsag, Traffic-Grade, Polysulfide Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T and Use I.
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. Pecora Corporation; Synthacalk GC-2+.

2.5 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Building Systems; Sonolac.
b. Pecora Corporation; AC-20+.
c. Tremco Incorporated; Tremflex 834.

2.6 PREFORMED JOINT SEALANTS

A. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
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. EMSEAL Joint Systems, Ltd.; Emseal 25V.
b. Sandell Manufacturing Co., Inc.; Polyseal.
c. Willseal USA, LLC; Willseal 150 or Willseal 250.

2.7 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint 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 according to ASTM E90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; AC-20 FTR.
   b. USG Corporation; SHEETROCK Acoustical Sealant.

2.8 JOINT SEALANT BACKING

A. General: Provide sealant backings of material 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 C1330, Type C (closed-cell material with a surface skin) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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. Provide self-adhesive tape where applicable.

2.9 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 to 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. Remove laitance and form-release agents from concrete.
3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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 in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 290 for use of latex sealants.

D. Install sealant backings of kind 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 backs of joints.

F. Install sealants using proven techniques that 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 in 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 in subparagraphs 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 sealant from surfaces adjacent to joints.
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 profile per Figure 8A in ASTM C1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

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 and cured sealant joints as follows:
    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. 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 kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
4. 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.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion 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.

3.5 CLEANING

A. Clean off excess sealant 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 original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between plant-precast architectural concrete paving units.
      d. Joints in stone paving units, including steps.
      e. Joints between different materials listed above.
      f. Other joints as indicated.
   2. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interoir and Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Joints at tops and sides of sloped concrete slabs abutting or supporting CMU walls. No Sealant shall be applied where weeps are indicated through CMU walls.
   2. Urethane Joint Sealant: Immersible, multicomponent, nonsag, traffic grade.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Joints between plant-precast architectural concrete units.
      c. Control and expansion joints in unit masonry.
      d. Joints in dimension stone cladding.
      e. Joints in exterior insulation and finish systems.
      f. Joints between metal panels.
      g. Joints between different materials listed above.
      h. Perimeter joints between materials listed above and frames of doors windows and louvers.
      i. Control and expansion joints in ceilings and otheroverhead surfaces.
      j. Other joints as indicated.
   2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Vertical joints on exposed surfaces of interior unit masonryconcrete walls and partitions.
      d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
      e. Other joints as indicated.
   2. Joint Sealant: Acrylic Latex or Siliconized Acrylic Latex.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 9200

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SECTION 079205 - PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following:

1. Expansion and contraction joints within portland cement concrete paving.
2. Joints between portland cement concrete paving and asphalt paving.
3. As specified in the details or as directed by the ENGINEER.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 32 Section "Asphalt Paving" for construction of joints between asphalt paving and concrete paving.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data from manufacturers for each joint sealant product required.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.5 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 period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40° F (4.4° C).
3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, 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.

2.2 COLD-APPLIED JOINT SEALANTS

A. Silicone Sealant for Concrete: One-part, low-modulus, neutral-cure silicone sealant complying with ASTM C 920 for Type S, Grade as indicated below, Class 25, and as follows:

1. Use Related to Exposure (As Recommended by Manufacturer): Use T.
2. Uses Related to Joint Substrates: Uses M and, as applicable to joint substrates of concrete highways and concrete runways of airports subject to jet fuel exposure, O.
3. Uses Related to Joint Substrates: Uses M and, as applicable to joint substrates of concrete highways, O.
4. Grade P for joints in horizontal paved surfaces.
5. Grade NS for vertical and other joints where installation of a Grade P (self-leveling) sealant would result in sealant flowing out of joint.
6. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

    a. 100% movement in extension and 50% movement in compression for a total of 150% movement.

B. Silicone Sealant for Concrete and Asphalt: One-part, low-modulus, neutral-cure silicone sealant complying with ASTM C 920, Type S, Grade P, Class 25, and Uses T, M, and as applicable to joints with concrete and asphalt substrates, O and with the following requirements:

1. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:

    a. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

C. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Grade P Silicone Sealant for Concrete:

a. "Roadsaver Silicone-SL," Crafco Inc.
b. "Dow Corning 888-SL," Dow Corning Corp.

2. Grade NS Silicone Sealant for Concrete:

a. "Roadsaver Silicone," Crafco Inc.
b. "Dow Corning 888," Dow Corning Corp.

3. Silicone Sealant for Concrete and Asphalt:

a. "Dow Corning 890-SL," Dow Corning Corp.

2.3 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: One-part formulation complying with ASTM D 3406.

B. Sealant for Concrete and Asphalt: One-part formulation complying with ASTM D 3405.

C. Low-Modulus Sealant for Concrete and Asphalt: Proprietary, pourable petropolymer formulation with the following physical properties measured per ASTM D 3407 with modifications to test methods noted:

1. Penetration with 150-gram cone after 5 seconds:

a. At 77E F (25E C): 1.2 mm plus or minus 0.2 mm.
b. At 0E F (17.8E C): 0.4 mm minimum.

1) Modification: Specimen conditioned 24 hours at 0E F (17.8E C).

2. Flow at 140E F (60E C): 0.3 cm maximum.
3. Resilience at 77E F (25E C): 60% minimum.

a. Modification: Ball penetrometer coated with talc, no glycerine.

4. Elongation:

a. At 77E F (25E C): 600% minimum.

1) Modification: Specimen changed to ¾" by ¾" by 2".

b. At -20E F (-29E C): 300%.

1) Modification: Specimen changed to ½" by ½" by 2" and extended 1½" for one (1) cycle.

5. Bond at -20E F (-29E C): Passes three (3) cycles.

a. Modification: Standard specimen extended 100% of original width without separating development of any cracks or other opening over ¼" deep.

D. Available Products: Subject to compliance with requirements, hot-applied joint sealants that may be incorporated in the Work include, but are not limited to, the following:

1. Elastomeric Sealant for Concrete:

a. "Product #9012," Koch Materials Co.

2. Sealant for Concrete and Asphalt:

a. "ROADSAVER 221," Crafco Inc.
b. "Product #9005," Koch Materials Co.
c. "Product #9030," Koch Materials Co.
d. "SEALTIGHT HI-SPEC," W.R. Meadows, Inc.

3. Low-Modulus Sealant for Concrete and Asphalt:

a. "SEALTIGHT SOF-SEAL," W.R. Meadows, Inc.

2.4 JOINT FILLERS FOR CONCRETE PAVING

A. General: Provide joint fillers of thicknesses and widths indicated.

B. Self-Expanding Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type III.

C. Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type II.

D. Sponge Rubber Joint Filler: Preformed strips complying with ASTM D 1752 for Type I.

E. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:

1. Asphalt saturated fiberboard.
2. Granulated cork with asphalt binder encased between 2 layers of saturated felt or glass-fiber felt of width and thickness indicated.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; 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. Backer Rods for Cold-Applied Sealants: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible, plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, and non-out-gassing

in unruptured state.

C. Backer Rods for Hot-Applied Sealants: Cross-linked, closed-cell polyolefin foam or polyethylene foam, non-out-gassing, non-staining, and capable of withstanding high temperatures of hot-applied joint sealants.

1. Available Products: Subject to compliance with requirements, backer rods for hot-applied sealants that may be incorporated in the Work include, but are not limited to, the following:

a. "HBR XL," Applied Extrusion Technologies., Inc.
b. "SEALTIGHT CERA-ROD," W.R. Meadows, Inc.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as 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.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant-substrate tests and field tests.

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. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants

relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.
b. Do not stretch, twist, puncture, or tear joint fillers.
c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

F. Provide joint configuration to comply with recommendations of sealant manufacturer unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 that installations with repaired areas are indistinguishable from original work.

END OF SECTION 079205

SECTION 08 1113 - 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 hollow-metal work.

B. Related Requirements:
1. Section 08 7100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

F. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

G. ASTM C476 - Standard Specification for Grout for Masonry.

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

I. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.

J. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

L. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames.

M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

N. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

O. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.

P. UL 9 - Standard for Fire Tests of Window Assemblies.

Q. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.4 COORDINATION

A. Coordinate anchorage installation 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.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:
1. Elevations of each door type.
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 each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-(102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Republic Doors and Frames.
2. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and 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 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. All doors and frames within training buildings shall comply with Exterior Doors and Frames Article.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4.
1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches
    c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 (ZF120) coating.
    d. Edge Construction:Model 2, Seamless.
    e. Core: Polyisocyanurate Vertical steel stiffener.
        1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 degrees Fahrenheit x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C1363.
3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 (ZF120) coating.
b. Construction: Full profile welded.

4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup 0.04 inch (2.01 inch) (10 inch)wire anchors not less than 0.177 inch thick.
2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

C. Frame Anchors: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M, hot-dip galvanized according to ASTM A153/A153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143/C143M.

G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

H. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 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 metal thickness. Where practical, fit and assemble

units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: 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.
1. 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.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      1) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      2) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
   b. Compression Type: Not less than two anchors in each frame.
   c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide loose stops and moldings on inside of hollow-metal work.
   4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.

2.9 ACCESSORIES

A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
   1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
   2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
   3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. 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. Drill and tap doors and frames to receive nontemplated, 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 SDI A250.11 or NAAMM HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
   a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
   c. Door Undercut: 4 inches unless indicated otherwise.
   d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

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 Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 1113

SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Areaway door units mounted on a flat foundation; exterior.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

2.2 AREAWAY DOOR UNITS MOUNTED ON A FLAT FOUNDATION; EXTERIOR

A. Areaway Door Unit Mounted on Flat Foundation: Factory fabricated, fully assembled units with sides and sloping doors with bent or welded corner joints filled, and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Size: .
      a. Interior Width: As indicated on drawings.
         1) {CH#40229}
      b. Foundation Exterior Width: As indicated on drawings.
      c. Interior Length (at top of foundation): As indicated on drawings.
         1) Provide areaway unit with clear interior length matching interior clear length of areaway at top of foundation.
      d. Foundation Exterior Length: As indicated on drawings.
      e. Height at Top of Slope: 30 inches.
   2. Accessories
      a. Foundation Plates: Provide manufacturer's standard foundation plates to cover flat surface of top of foundation walls. Plates shall match finish of areaway unit.
      b. Extensions: Provide manufacturer's standard horizontal extension units to extend from back of areaway unit to adajcent wall surface to close gaps and maitain weathertight installation.
      c. Keyed Lock Kit: Provide manufacturer's standard keyed lock unit to secure door from outside. Unit shall be equipped with rubber cap for weather protection.
         1) Lock: Cylinder lock with latch, two keys for each unit.

d. Weather Strip Kit: Provide manufacturer's standard weather stripping/ gasketing kit specifically designed to seal the intricate shape and areas of the areaway door unit.

3. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable product by another manufacturer.
   a. Basis of Design BILCO Company; Classic Steel Sided Door, Model Size O.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 08 3100

SECTION 08 7100 - DOOR HARDWARE

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

C. BHMA A156.4 - Door Closers and Pivots.

D. BHMA A156.13 - Mortise Locks & Latches Series 1000.

E. BHMA A156.16 - Standard for Auxiliary Hardware.

F. BHMA A156.21 - Thresholds.

G. BHMA A156.22 - Standard for Gasketing.

H. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems.

I. ISO 9000 - Quality Management Systems -- Fundamentals and Vocabulary.

J. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.2 RELATED DOCUMENTS

PART 2 DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

2.1 SUMMARY

A. Section Includes:
   1. Interior and exterior finish hardware as indicated in Door Schedule and Hardware Schedule on the Drawings.
   2. Types of finish hardware include, but is not limited to:
      a. Hinges / butts
      b. Lockset, latchset and bolts
      c. Cylinders and keys
      d. Door closers
      e. Door silencers
      f. Door stops
      g. Door trim units
      h. Protection and kick plates
      i. Weatherstripping / door gasketing

j. Door seals
k. Door thresholds

3. All necessary trim, fastening, miscellaneous attachments and accessories to provide a complete installation.

2.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
1. Tag Samples with full product description to coordinate Samples with door hardware schedule.

C. Samples for Verification: For each type of exposed product, in each finish specified.
1. Sample Size: Full-size units or minimum 2-by-4-inch (51-by-102-mm) Samples for sheet and 4-inch (102-mm) long Samples for other products.
a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
2. Tag Samples with full product description to coordinate Samples with door hardware schedule.

D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:
a. Identification number, location, hand, fire rating, size, and material of each door and frame.
b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
e. Fastenings and other installation information.
f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
g. Mounting locations for door hardware.
h. List of related door devices specified in other Sections for each door and frame.

E. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

2.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Architectural Hardware Consultant.

B. Sample Warranty: For special warranty.

2.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

B. Schedules: Final door hardware and keying schedule.

2.5 DELIVERY, STORAGE, AND HANDLING

A. Protection:
1. Hardware to be stored at the jobsite in a safe, dry place with all labels intact and legible at time of installation.
2. Use all means to protect hardware before, during, and after installation. Do not allow product to become wet or damp.

B. Replacements - In the event of damage, including water intrusion, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

C. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

D. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

2.6 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
1. Scheduling Responsibility: Preparation of door hardware and keying schedule.
2. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC).

2.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of doors and door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
   2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
      a. Manual Closers: 30 years from date of Substantial Completion.
      b. Locksets: 3 years from date of Substantial Completion.

PART 3 PRODUCTS

3.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.
   1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

3.2 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

3.3 SCHEDULED DOOR HARDWARE

A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
   1. Door hardware and hardware sets are scheduled on the Drawings.

3.4 HINGES

A. Burn Building Hinges: ANSI A5111.
   1. Basis of Design Product: Subject to compliance with requirements, provide Stanley Commercial Hardware model IHTCB199 or comparable product by another manufacturer.
   2. Type: Five-knuckle, full mortise, concealed bearing.
   3. Size: 5 x 5-1/4 inches.
   4. Base metal: Stainless Steel; 0.19 gauge
   5. Description: Institutional type hinge fabricated from wrought stainless steel. Dimensions shall comply with ANSI A156.7 "Standard For Template Hinge Dimensions." Lateral and vertical loads shall be accommodated by bearings with anti-friction self-lubricating materials. Pins shall be non-removable. Hinges shall be tested to cycle a 300 lb. door a minimum of 2,500,000 times.
   6. Finish: US32D, Satin Stainless Steel

3.5 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
   1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

C. Lock Backset: 2-3/4 inches, unless otherwise indicated.

D. Lock Trim:
   1. Description: ADA accessible, "L" shaped lever consisting of a round spindle and rectangular profile lever, with hooked end returning to within 1/2 inch of door face; and a flat profile, square edged, rectangular escutcheon plate 1-3/4 inches wide by 8-1/2 inches high, with concealed fasteners, prepared for key cylinder.
   2. Levers: Cast.
      a. Stainless Steel.
      b. Schlage; "Longitude"
   3. Escutcheons (Roses): Solid Stainless Steel.
   4. Dummy Trim: Match lever lock trim and escutcheons.

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

F. Mortise Locks: BHMA A156.13; Grade 1; stamped steel case with steel or brass parts; Series 1000.
   1. Function as indicated in Hardware Schedule for each unit.
   2. Base Metal: Stainless steel for all exposed parts
   3. Finish: BHMA 32D Satin Stainless Steel
   4. Basis-of-Design Product: Subject to compliance with requirements, provide Schlage Commercial Lock Division; an Allegion company; L Series (Mortise); or comparable products by one of the following:
      a. Schlage L9000 series.

3.6 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
   1. Finish: US 26D Satin Chrome Plated.
   2. Strikes: Provide mortise strike for head, and spring-loaded, flanged dust-proof strike for floor.
   3. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
      b. Allegion plc.

3.7 LOCK CYLINDERS

A. Scheduled Manufacturer and Product: Schlage Everest 29 Primus XP FSIC for all exterior doors with access control and also the mechanical and sprinkler rooms. All other exterior doors to receive Schlage Everest 29T FSIC.

B. Acceptable Manufacturers and Products: No Substitute.

3.8 KEYING

A. Master Keying: Key all cylinders and locks as directed by the Owner

B. Number of Keys: Furnish three keys for each level of keying, as directed by the Architect.

C. Construction Keying: Furnish a construction master key system with 15 keys for locks and cylinders. Use only the construction keys during construction.

D. Identification and Delivery: Factory stamp permanent keys as directed by Architect. Identify permanent keys with tags and delivery directly to the Owner.

3.9 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key- holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Key Boxes and Cabinets.
      b. GE Security, Inc.
      c. HPC, Inc.
      d. Lund Equipment Co., Inc.
      e. MMF Industries.
      f. TelKee; Oasis International.
   2. Wall-Mounted Cabinet: Grade 1 cabinet with hinged-panel door equipped with key- holding panels and pin-tumbler cylinder door lock.

3.10 DOOR CLOSERS

A. Manufactures and Products:
   1. Scheduled Manufacturer and Product: LCN 4040XP series.
   2. Acceptable Manufacturers and Products: No Substitute

B. Requirements:
   1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
   2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
   3. Cylinder Body: 1-1/2 inch diameter with 3/4 inch diameter double heat-treated pinion journal.
   4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.

5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

C. Provide overhead stop option where indicated in Door Hardware Sets. Stop point shall be field- adjustable.

D. Provide overhead holder option where indicated in Door Hardware Sets. Hold open point shall be field-adjustable.

E. Size closer for each door based on Manufacturer's recommendation for weight and height of door; wind conditions; and location of closer.

F. Where overhead door control items are indicated to be used on the same door leaf in conjunction with surface closers, coordinate the closer type, mounting location, and bracket types to ensure full operation and intended functionality of closer and overhead door control device.
1. Basis-of-Design Product: Subject to compliance with requirements, provide LCN; 4041 Series or comparable product by one of the following:
   a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.

3.11 MECHANICAL STOPS AND HOLDERS

A. Wall-Mounted Stops: BHMA A156.16.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Rockwood; #467 or comparable product by one of the following:
   a. Baldwin Hardware Corporation.
   b. Hager Companies.
   c. Trimco.

3.12 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
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. Pemko Manufacturing Co.
   b. Reese Enterprises, Inc..
   c. Zero International, Inc.

B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
   1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
   2. Gasketing on Double Doors: 0.50 cfm per ft. (0.000774 cu. m/s per m) of door opening.

C. Adhesive-Backed Perimeter Gasketing: Neoprene bulb gasket material applied to frame rabbet with self-adhesive.

3.13 DOOR SWEEPS

A. Door Sweep with Drip Cap: "U" profile extruded aluminum for slip fit over bottom edger of door, with integrally-extruded outside drip edge and removable finned resilient bulb in bottom retaining track.
   1. Basis-of-Design Product: Pemko 216APK.

3.14 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

B. Burn Building / Multi-purpose Building Configuration: Mill-aluminum, heavy duty saddle style threshold.
   1. Basis of Design Product: Subject to compliance with requirements, provide Pemko 1716 or comparable product by another manufacturer.

PART 4 EXECUTION

4.1 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as directed by Owner.
   2. Furnish permanent cores to Owner for installation.

E. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 9200 "Joint Sealants."

G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
1. Do not notch perimeter gasketing to install other surface-applied hardware.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

4.2 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

4.3 DOOR HARDWARE SCHEDULE

A. Refer to Prop Drawings for hardware sets noted on drawings.

END OF SECTION 08 7100

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SECTION 08 9000 - LOUVERS AND VENTS

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. Fixed, extruded-aluminum and formed-metal louvers.
2. Blank-off panels for wall louvers.

B. Related Sections:
1. Section 04 2000 "Unit Masonry" for building wall vents (brick vents) into masonry.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.5 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
   1. Temperature Change (Range): 120 degrees Fahrenheit, ambient; 180 degrees Fahrenheit, material surfaces.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
   2. Show mullion profiles and locations.
   3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

E. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

C. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.

F. Provide subsills made of same material as louvers or extended sills for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver :
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. Airolite Company, LLC (The).
   b. Construction Specialties, Inc.
   c. Ruskin Company; Tomkins PLC.
2. Louver Depth: 4 inches .
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Louver Performance Ratings:
   a. Free Area: Not less than 8.0 sq. ft. (0.65 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
   b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s) free-area intake velocity.
5. Frame Type: Channel type, unless otherwise indicated.
6. Blade Profile: Blade with center baffle.
7. Blade angle: 45 degrees unless otherwise indicated.
8. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.5 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 4-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 substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 9200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 9000

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SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

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 surface preparation and the application of high-performance coating systems on the following substrates:
   1. Exterior Substrates: (All steel, galvanized metal, masonry and concrete surfaces of Training Buildings and Structures are classified as exterior surfaces.)
      a. Concrete, surfaces.
      b. Concrete masonry units (CMUs).
      c. Steel.
      d. Galvanized metal.
   2. Interior Substrates:
      a. Concrete, surfaces.
      b. Concrete masonry units (CMUs).
      c. Steel.
      d. Galvanized metal.
      e. Gypsum board.

B. Related Requirements:
   1. Section 05 1200 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
   2. Section 05 5213 "Pipe and Tube Railings" for shop priming pipe and tube railings with coatings specified in this Section.

1.3 DEFINITIONS

A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 REFERENCE STANDARDS

A. ASTM D523 - Standard Test Method for Specular Gloss.

B. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals.

C. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated. (Color Fan)

C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps 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: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.7 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 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 (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
2. Duron, Inc.
3. ICI Paints
4. PPG Architectural Finishes, Inc.
5. Sherwin-Williams Company (The).

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:
1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction. Patining supplier shall verify during the bidding process that all specified paints/coverings comply. Where items do not comply with the AHJ VOC limitations, supplier shall immediately notify the Archtiect by means of RFI. Where no RFI is submitted, the contractor shall provide a comparable system/item that complies with the VOC limitations of the AHJ.

D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Color selection is often limited because some coating materials yellow or degrade under some environmental conditions.

F. Colors: As selected by Architect from manufacturer's full range.

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 the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and 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.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
1. Clean surfaces with pressurized water. Use pressure range of 4000 to 10,000 psi at 6 to 12 inches (150 to 300 mm).

E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches (150 to 300 mm).

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
1. SSPC-SP 6/NACE No.3.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, 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 coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:
1. Pigmented Polyurethane over Epoxy System MPI EXT 3.1M:
    a. Prime Coat: Epoxy, matching intermediate coat.
    b. Intermediate Coat: Epoxy, gloss, MPI #77.
    c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

B. CMU Substrates:
1. Pigmented Polyurethane over High-Build Epoxy System MPI EXT 4.2G:
    a. Block Filler: Block filler, epoxy, MPI #116.
    b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.
    c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6), MPI #72.

C. Steel Substrates:
1. Epoxy System MPI EXT 5.1F:
    a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
    b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.
    c. Topcoat: Epoxy, gloss, MPI #77.

D. Galvanized-Metal Substrates:
1. Epoxy System MPI EXT 5.3C:
    a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
    b. Intermediate Coat: Epoxy, matching topcoat.
    c. Topcoat: Epoxy, gloss, MPI #77.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Concrete Substrates, Vertical Surfaces:
1. Epoxy-Modified Latex System MPI INT 3.1G:
    a. Prime Coat: Epoxy-modified latex, matching topcoat.
    b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
    c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.

B. CMU Substrates:
   1. Epoxy-Modified Latex System MPI INT 4.2J:
      a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
      b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
      c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.
   2. Clear (Two-Component) Polyurethane System MPI INT 4.2Q:

C. Steel Substrates:
   1. Epoxy-Modified Latex System MPI INT 5.1K:
      a. Prime Coat: Primer, rust inhibitive, water based, MPI #107.
      b. Intermediate Coat: Epoxy-modified latex, interior, matching topcoat.
      c. Topcoat: Epoxy-modified latex, semi-gloss (MPI Gloss Level 5), MPI #215.

D. Galvanized-Metal Substrates:
   1. Epoxy over Epoxy Primer System MPI INT 5.3D:
      a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
      b. Intermediate Coat: Epoxy, matching topcoat.
      c. Topcoat: Epoxy, gloss, MPI #77.

END OF SECTION 09 9600

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SECTION 10 1100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Visual display board assemblies.

1.2 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.
   1. Include plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints.
   3. Include sections of typical trim members.

C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
   1. Actual factory-finish color samples, applied to aluminum substrate.
   2. Include accessory Samples to verify color selected.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: Life of the building.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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: 25 or less.
   2. Smoke-Developed Index: 50 or less.

2.2 VISUAL DISPLAY BOARD ASSEMBLY

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. Claridge Products and Equipment, Inc.
   2. Delta Products, Ltd.
   3. EverWhite.
   4. PolyVision Corporation, a Steelcase company.

B. Visual Display Board Assembly: factory fabricated.
   1. Assembly: markerboard.
   2. Corners: Square.
   3. Width: As indicated on Drawings.
   4. Height: As indicated on Drawings.
   5. Mounting Method: Direct to wall.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
   1. Color: As selected by Architect from full range of industry colors.

D. Aluminum Frames: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; slim size and standard shape.
   1. Aluminum Finish: Clear anodic finish.

a. Color: As selected by Architect from full range of industry colors and color densities.

E. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

2.3 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with high low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
1. Face Sheet Thickness: 0.021 inch uncoated base metal thickness.
2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.4 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Extruded Aluminum: ASTM B221 (((ASTM B221M))), Alloy 6063.

C. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0 inch or thicker.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

E. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
   2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 1100

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SECTION 10 1419 - DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Dimensional characters.
    a. Cast dimensional characters.
        1) Address Numbers/Letters; Provide whether indicated on drawings or not.

1.2 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum.

B. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

D. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.
1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
1. Dimensional Characters: Full-size Sample of each type of dimensional character.
2. Exposed Accessories: Half-size Sample of each accessory type.
3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

E. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 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: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cast Characters : Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
   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. A.R.K. Ramos.
      b. ACE Sign Systems, Inc.
      c. ASI Sign Systems, Inc.
      d. Cosco.
      e. Gemini Incorporated.
      f. Matthews International Corporation; Bronze Division.

g. Metal Arts.
h. Metallic Arts.
i. Southwell Company (The).

2. Character Material: Cast aluminum.
3. Character Height:
   a. Address Numbers/Letters: Minimum height required by authority having jurisdiction but not less than 6 inches.
   b. Other Numbers/Letters: As indicated on Drawings.
4. Thickness: Manufacturer's standard for size of character.
   a. All characters on sign face shall be the same thickness.
5. Finishes:
   a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
6. Mounting: Concealed studs.
7. Typeface: As indicated on drawings.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. For exterior exposure, furnish stainless steel devices unless otherwise indicated.
   3. Exposed Metal-Fastener Components, General:
      a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
      b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.
   4. Sign Mounting Fasteners:
      a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
      b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to 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. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
5. 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.
6. 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.

2.5 GENERAL FINISH REQUIREMENTS

A. 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.

B. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0 inch or thicker.

B. Color Anodic Finish: AAMA 611, Class I, 0 inch or thicker.

2.7 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
1. Directional Satin Finish: No. 4.

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. 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 according to 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.
   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.

3.3 ADJUSTING AND CLEANING

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.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to 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 10 1419

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SECTION 10 5613 - METAL STORAGE SHELVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Four post shelving.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Rated uniform shelf loads.
2. Details of shelving assemblies, including reinforcement.
3. Accessories.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.

D. Executed warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged units.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.4 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty for rust, corrosion, and manufacturing defects. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 SHELVING - GENERAL

A. See drawings for layout and sizes.

B. Anchors: Provide anchoring hardware to secure each shelving unit to wall.
1. Provide hardware of type recommended by manufacturer for substrate.

2.2 FOUR POST SHELVING

A. Four Post Shelving; EQ-16: Steel post-and-beam type with shelving brackets and accessories as specified.
   1. Basis of Design Product: Subject to compliance with requirements, provide basis of design product indicated or comparable product by another manufacturer.
      a. Basis of Design: Penco; RivetRite - Boltless Steel Shelving; Single Rivet, Heavy Duty.
   2. Unit Width: 48 inches, center to center of posts.
   3. Overall Shelf Capacity: Not less than 1,000 lbs.
   4. Adjustability of Shelving: At intervals of 1-1/2 inch on center, minimum.
   5. Shelf Depth: 24 inches, minimum.
   6. Shelves per Unit: Four.
   7. Unit Height: 84 inches, overall , maximum.
   8. Color: As selected by Architect from manufacturer's standard range.
   9. Number of Units: As indicated on drawings.
   10. Posts and Beams: Formed sheet members.
      a. Metal Thickness: 14 gauge, 0.0747 inch Manufacturer's standard thickness as required to meet loading requirements.
      b. Post Shape: Tee intermediate posts, angle end posts forming corners.
      c. Post Face Width: As required to comply with loading requirements; not less then 1-7/8 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is level and that clearances are as specified.

B. Verify that walls are suitable for shelving attachment.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.

C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

D. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.3 CLEANING

A. Clean shelving and surrounding area after installation.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 10 5613

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SECTION 11 6733 - STRUCTURAL FIRE TRAINER SYSTEMS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Computer controlled interior gas-fueled live fire training systems (Class 'B').

B. Class 'A' fire simulated equipment.

1.2 COORDINATION

A. Coordinate installation of computer controlled interior gas-fueled live fire training systems and accessories that are anchored to or that receive other work. 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.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: For each type and size of products and accessories required, provide product description, dimensions of individual components, finishes, gas supply requirements, electrical requirements, low voltage/data requirements, component connections and details, rated capacities, and operating characteristics.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data, include plans, elevations, sections, installation details, points of attachments to other work, hardware and control locations, pertinent dimensions, required clearances, location and size of field connections, diagrams of power, and diagrams for signal and control wiring.

D. Manufacturer's Receiving, Storing and Handling Instructions: Provide both requirements and recommendations for the receipt, storage, and handling of computer controlled interior gas-fueled live fire training equipment.

E. Manufacturer's Installation Instructions: Indicate tasks required for the preparation and installation; indicate installation sequence and indicate procedures for installation, adjustment and alignment.

F. Certificate: Certify products of this section meet or exceed specified requirements.

G. Designer's qualification statement.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

J. Manufacturer's instructions for inspection, testing and maintenance of the system.

K. Inspection Report
1. Final inspection acceptance and start-up report signed by system vendor certifying the live fire training system is installed in accordance with the manufacturer's specifications. The report shall validate the following elements of the installation.
   a. All piping conveying flammable gases inspected for leaks prior, during and after commissioning.
   b. Components are installed and connected in accordance with the manufacturers' system design.
   c. Burner management system testing and verification for compliance with the applicable design criteria.
   d. Documentation that confirms that all safety related devices and safety logic are functional.
   e. Any changes to the original design made during commissioning are reflected in the as-built documentation.
   f. Documentation of set points for all safety interlock systems and or components.
   g. All safety critical components of the gas fueled live fire training system are rated and labeled for the intended use.
   h. Applicable Tests:
      1) Burner(s) Flame Failure Response Time (FFRT)
      2) Burner(s) Trial for Ignition (TFI)
      3) High Gas Pressure Switch
      4) Low Gas Pressure Switch
      5) Combustion Air Interlock Switch
      6) Gas Supply Pressure
      7) Burner(s) Manifold Pressure
      8) Observation of smooth ignition and shutdown
      9) Temperature Readings (Components and Structure)
      10) Pilot Turndown
      11) E-Stop
      12) Exhaust Fan Operation (1 air change per minute)
      13) Exhaust Fan Air Proving Switch
      14) Combustible Gas Detection (System Shutdown @ 25% LEL)
      15) Combustible Gas Detection Pump Monitoring Device
      16) Temperature Monitoring (System Shutdown @ the Lower of 500F or 50C)
      17) Operator Present *Deadman*

L. On-Site NRTL Inspection and Certification: Final inspection by a Nationally Recognized Testing Laboratory (NRTL) in accordance with NFPA 1402, Standard on Facilities for Fire Training and Associated Props. Cost for all corrective action related to live fire training equipment following completion of the field inspection shall be the responsibility of the fire training equipment supplier.

M. Training Information: Provide training course outline of goals and materials to be covered.

N. Operation and Maintenance Data.

O. Executed warranty.

1.4 QUALITY ASSURANCE

A. The Live Fire Trainers' equipment shall be designed and installed in accordance with the latest editions of the following codes and standards:

1. NFPA 54: National Fuel Gas Code
2. NFPA 58: Liquefied Petroleum Gas Code
3. NFPA 70: National Electrical Code
4. NFPA 1402: Standard on Facilities for Fire Training and Associated Props, 2019 ed.
5. NFPA 86, Standard for Ovens and Furnaces, Sixteenth Edition
6. UL 508A, Standard for Industrial Control Equipment.
7. ANSI Z21 & 83: Series Standard for Gas Utilization Equipment

B. Live structural fires shall be compliant and meet the criteria for training as specified in the following NFPA manuals:
1. NFPA 1001: Standard for Fire Fighter Professional Qualifications
2. NFPA 1403: Standard on Live Fire Training Evolutions (now NFPA1400)
3. NFPA 1500: Standard on Fire Department Occupational Health & Safety

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 5 years of documented experience.

D. Installer Qualifications: Company specializing in performing work of type specified, with minimum 5 years of documented experience with projects of similar scope and complexity and approved by manufacturer.
1. Provide Installers Certificate: Signed certificate by the system manufacturer certifying that Installer is approved, authorized, and/or licensed by the manufacturer to install the system.

E. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Comply with Manufacturer's requirements and recommendations for storing and handling ma

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty, General:
1. Computer controlled interior gas-fueled live fire training systems (Class 'B')
   a. Manufacturer Warranty: Provide 3-year manufacturer warranty commencing on Date of Substantial Completion, for all products and components.
      1) The supplier shall provide a toll-free customer service telephone number that can be used by the Owner 24 hours per day, 7 days per week to contact the fire training prop vendor’s customer service department.
      2) Manufacturer shall perform as part of the warranty an annual visit and inspection of the computer controlled interior gas-fueled live fire training systems (Class 'B').
         a) Manufacturer shall perform at each visit typical preventative maintenance of the system and equipment.
         b) Annual visits shall be scheduled within 30 days prior to the 1-year, 2-year, and 3-year anniversary of the date of Substantial Completion.

b. Class 'A' fire simulated equipment
   1) Manufacturer Warranty: Provide 1-year manufacturer warranty commencing on Date of Substantial Completion, for all products and components.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations: Furnish each product type produced by single manufacturer and obtained from single supplier.

2.2 PRODUCT SUBSTITUTIONS

A. These specifications are not intended to limit or restrict the purchase of computer controlled interior gas-fueled live fire training systems to one manufacturer. As a result of the complexity and integration of the systems, their impact on the layout and engineering of the building systems and components and their impact on environmental safety, occupant safety, and the protection of the surrounding areas outside of the training buildings/structures, Basis of Design products were utilized to inform, shape, and engineer the building layout, the building systems, and the building structure and assemblies. Any products proposed other than the Basis of Design products for the computer controlled interior gas-fueled live fire training systems shall be considered substitutions. Contractors, manufacturers, and/or vendors proposing substitutions shall be required to bare the cost of any and all re-engineering and re-design required as a result of utilizing a comparable and acceptable substitution. These costs may include, but are not limited to, Architectural and Engineering fees, cost impacts to Prime Contractors and other Contract Packages, material and labor costs for other work required to be modified, permitting fees, testing and inspection fees and other fees required as a result of the substitution.
   1. Computer controlled interior gas-fueled live fire training system substitutions shall be required to be submitted and acceptable prior to the date of bid submission as required for Procurement Substitutions. See Section 00 2600 - Procurement Substitution Procedures. No substitutions shall be accepted after the bid submission date.

2.3 BASIS OF DESIGN MANUFACTURER FOR SYSTEMS AND PRODUCTS

A. Subject to compliance with requirements, provide computer controlled interior gas-fueled live fire training systems and equipment by the following manufacturer or comparable systems/equipment by another qualified manufacturer.
   1. Basis of Design Manufacturer: Symtech Fire LLC; PO Box 493, Berkeley Heights, NJ 07922; info@symtechfire.com.

2.4 COMPUTER CONTROLLED INTERIOR GAS-FUELED LIVE FIRE TRAINING SYSTEMS

A. Performance Requirements
   1. All components in this system shall perform to the following minimum standards:
      a. Compartment Equipment

1) Temperature: 32 deg F to max. (Operating); -20 to 125 deg F (Storage)
2) Humidity: 0 to 100 percent

b. Mechanical: All training compartment equipment shall withstand direct hose pressure of 100 PSI at 100 GPM from a distance of three feet.

B. General

1. The live fire training system for the facility shall consist of multiple gas fired props as listed within the table below. Each prop shall be located in a separate burn room with independent safety systems except where otherwise specified.

TRAINING FIRES	OPTIONAL EFFECT FIRES			FIRE LOCATION	DEDICATED SMOKE MACHINE	LOCAL CONTROL TYPE	SOUND SYSTEM SPEAKER
	Flashover/ Rollover	Flare-up	Extension Fire				
Industrial Rack Fire Prop	No	No	No	Basement	Yes	Wireless	Yes
Kitchen Stove Fire Prop	No	No	Yes	First Floor	Yes	Wireless	Yes
Queen Bed with side table	No	No	Yes	Second Floor	Yes	Wireless	Yes
Hallway Rollover Prop	Yes	No	No	Second Floor	No	Wireless	Yes
Sofa Prop	No	No	No	Second Floor	Yes	Wireless	Yes

C. Prop Descriptions

1. Industrial Rack Prop Fire Simulator:
   a. The Industrial Rack Fire shall consist of a three-level storage rack resembling that which would be typically found in a garage.
   b. The fire shall emit from the top of the mockup simulating an industrial rack fire.
   c. The fire shall be ignited by the operator with a Wireless Remote control. The Wireless controller shall include interactive LED's to indicate system status.
   d. The flame height shall be adjustable using the Wireless Remote including low, medium, and high flame settings at a minimum.
   e. The simulation burn room will be provided with an independent, integral smoke generation system/generator to fill the entire room. Upon initialization by the operator, smoke shall be emitted
      1) Smoke system will be capable of independent operation or concurrent with fire prop.
      2) Smoke machines will have a minimum output of 70,000 cfm.
   f. The fully involved fire shall reach the ceiling and shall cover the majority of the industrial fire mockup.
   g. All prop areas with direct flame impingement shall be 1/4" (6mm) thick steel.
   h. The Industrial Rack Prop Fire Simulator shall have a fully integrated stainless steel water containment unit. It shall include stainless steel casters and shall be capable of creating indoor or outdoor live fire scenarios. The use of a static mockup set inside a pan assembly is not acceptable.

i. The fire simulator shall have waterbath burner technology designed into the mockup to produce realistic flame and heat signatures over the mockup surface that can handle a direct stream attack. It shall be constructed to run either wet or dry and shall not require water fill to reduce steel deformation.
j. Upon activation of the main flame, ambient fire-crackling sounds shall automatically emit from one or more waterproof, shielded speakers in the burn room. Additional search and rescue sounds may be triggered by the operator from the Wireless Remote.

2. Stove Fire Simulator and Fire Extension:
   a. The kitchen fire shall consist of a stove and countertop mock-up typically found in a residential setting. The prop shall be in corner.
   b. The fire shall emit from the top of the mockup simulating a stove/countertop on fire.
   c. The fire shall be ignited by the operator with a Wireless Remote control. The Wireless controller shall include interactive LED's to indicate system status.
   d. The flame height shall be adjustable using the Wireless Remote including low, medium, and high flame settings at a minimum.
   e. The Kitchen Fire Simulator will be provided with an independent, integral smoke generation system/generator to fill the entire room. Upon initialization by the operator, smoke shall be emitted.
      1) Smoke system shall be capable of independent operation or concurrent with fire prop.
      2) All smoke machines will have a minimum output of 70,000 cfm.
   f. The fully involved fire shall reach the ceiling and shall cover the majority of the stove fire mockup. The minimum mockup surface area shall be 16 square feet (1.48 sq. meters). Systems with a small burn area are not acceptable.
   g. The stove prop shall have an independent pilot fire extension in the cabinet and shall be able to operate with the main fire, or independently
   h. All prop areas with direct flame impingement shall be 1/4" (6mm) thick steel.
   i. All pilot ignition devices and burners shall be concealed so as not to be visible to the trainees. The use of a static mockup set inside a pan assembly is not acceptable.
   j. The fire simulator shall have waterbath burner technology designed into the mockup to produce realistic flame and heat signatures over the mockup surface that is capable of handling a direct stream attack. It shall be constructed to run either wet or dry and shall not require water fill to reduce steel deformation.
   k. Upon activation of the main flame, ambient fire-crackling sounds shall automatically emit from one or more waterproof, shielded speakers in the burn room. Additional search and rescue sounds may be triggered by the operator from the Wireless Remote.

3. Queen Bed Prop Simulator and Fire Extension:
   a. The Queen Bed fire shall consist of a bed mock-up typically found in a residential setting, including a headboard and footboard.
   b. The fire shall emit from the top of the mockup simulating a bed on fire.
   c. The fire shall be ignited by the operator with a Wireless Remote control. The Wireless controller shall include interactive LED's to indicate system status.
   d. The flame height shall be adjustable using the Wireless Remote including low, medium, and high flame settings at a minimum.
   e. The Bed Fire Simulator will be provided with an independent, integral smoke generation system/generator to fill the entire room. Upon initialization by the operator, smoke shall be emitted.
      1) Smoke system shall be capable of independent operation or concurrent with fire prop.

2) All smoke machines shall have a minimum output of 70,000 cfm.

f. The fully involved fire shall reach the ceiling and shall cover the majority of the bed fire mockup
g. The queen bed prop shall have an independent pilot fire extension in the bed side table and shall be able to operate with the main fire, or independently
h. All prop areas with direct flame impingement shall be 1/4" (6mm) thick steel.
i. All pilot ignition devices and burners shall be concealed so as not to be visible to the trainees. The use of a static mockup set inside a pan assembly is not acceptable.
j. The fire simulator shall have waterbath burner technology designed into the mockup to produce realistic flame and heat signatures over the mockup surface that can handle a direct stream attack. It shall be constructed to run either wet or dry and shall not require water fill to reduce steel deformation.
k. Upon activation of the main flame, ambient fire-crackling sounds shall automatically emit from one or more waterproof, shielded speakers in the burn room. Additional search and rescue sounds may be triggered by the operator from the Wireless Remote.

4. Sofa Prop Simulator:
   a. The sofa fire shall consist of a sofa mock-up typically found in a residential setting.
   b. The fire shall emit from the top of the mockup simulating a sofa on fire.
   c. The fire shall be ignited by the operator with a Wireless Remote control. The Wireless controller shall include interactive LED's to indicate system status.
   d. The flame height shall be adjustable using the Wireless Remote including low, medium, and high flame settings at a minimum.
   e. The Sofa Fire Simulator will be provided with an independent, integral smoke generation system/generator to fill the entire room. Upon initialization by the operator, smoke shall be emitted.
      1) Smoke system will be capable of independent operation or concurrent with fire prop.
      2) All smoke machines will have a minimum output of 70,000 cfm.
   f. The fully involved fire shall reach the ceiling and shall cover the majority of the sofa fire mockup. The minimum mockup surface area shall be 1.48 sq. meters (16 sq. ft.). Systems with a small burn area are not acceptable.
   g. All prop areas with direct flame impingement shall be 1/4" (6mm) thick steel.
   h. All pilot ignition devices and burners shall be concealed so as not to be visible to the trainees. The use of a static mockup set inside a pan assembly is not acceptable.
   i. The fire simulator shall have waterbath burner technology designed into the mockup to produce realistic flame and heat signatures over the mockup surface that is capable of handling a direct stream attack. It shall be constructed to run either wet or dry and shall not require water fill to reduce steel deformation.
   j. Upon activation of the main flame, ambient fire-crackling sounds shall automatically emit from one or more waterproof, shielded speakers in the burn room. Additional search and rescue sounds may be triggered by the operator from the Wireless Remote.
5. Hallway Flashover-Rollover Effect Fire Simulator:
   a. The flashover/rollover effect fire shall be located in the hallway and shall provide trainees with practice in recognizing rollover conditions and making fight or flight decisions.
   b. The fire shall emit from a device that is inconspicuously mounted near the ceiling.
   c. The flashover-rollover shall include an independent, fully integrated pilot ignition system.
   d. The flashover-rollover shall be capable of at least 20 second of continuous operation with no more than 30 seconds of downtime between repeat ignitions.

e. The training space must include a full complement of NFPA compliant safety devices including temperature monitoring, gas detection monitoring, and an integral ventilation/exhaust system.
f. The fire shall be ignited by the operator with a Wireless Remote control. The Wireless controller shall include interactive LED's to indicate system status.
g. All pilot ignition devices and burners shall be concealed so as not to be visible to the trainees.

D. System Requirements
1. The system shall include a programmable logic controller (PLC) for each prop equipment room. The PLC shall monitor all safety devices and operational controls while recording and archiving message logs and event data. The PLC shall be programmed to place the system in fail safe shut down in the event of safety device activation, manual E-stop depressed or system inaccuracy.
2. The burn props shall be constructed of corrosion resistant steel. The props must be factory tested prior to delivery. Each burner must include an inextinguishable pilot and burner system.
3. The system shall include a smoke generation machine capable of up to 70,000 cfm distribution minimum. The smoke generation system shall be operated from the wireless or HMI (Human-Machine Interface) touch panel screen. The unit must provide the operator with the ability to vary discharge duration and intervals between cycles from the main control unit without the use of any external equipment. The smoke output from each machine shall be easily selected at the 15.5 inch touchscreen using a "Smokers" screen with a vertical slider bar for each machine where the use may select and output desired from 0 to 70,000 cfm by sliding the desired bar with their finger.
4. The system shall include a gas detection unit that is based on infrared absorption principle. Catalytic bead and/or static (non-draw sample) type gas detection units are not acceptable. The sensor must be temperature compensated and able to operate within an ambient temperature range of -40°F to 150°F and within ambient humidity conditions of 0 to 100%. Optics and electronics shall be hermetically sealed.
   a. The gas detection units shall verify a safe atmosphere within the burn room prior to and during all burn operations. The system shall verify a safe atmosphere prior to system operation. These units shall be interlocked with additional safety features.
   b. The gas concentration levels must constantly be displayed on the HMI (Human-Machine Interface) touch panel screen.
   c. The systems shall be preset to a 10% LEL warning level and 25% LEL alarm and shut down. A purge cycle shall then activate automatically. The gas monitoring unit features are interlocked to gas delivery and exhaust fan systems. An audible and visual alarm is activated during all elevated LEL conditions.
   d. The 15.5 inch touchpanel shall include a full color LEL over time line graph showing real time data for ALL gas sensors. Data shall be recorded as well.
5. Each burn prop room shall include temperature monitoring. Constant temperature monitoring shall exist whenever power is supplied to the system. Temperature sensors shall be located 60 inches above the finish floor level and initiate warning and automatic compartment ventilation at predetermined levels within the High Limit Temperature Controller.
   a. Training room temperature activation shall occur when the room temperature reaches 450°F 60-inches above the floor level. The system shall activate the ventilation system and display on the HMI (Human-Machine Interface) touch panel screen a color indicator that represents to the operator that an over temperature shut down is approaching.
   b. Training room temperature shutdown shall occur when the room temperature reaches 500°F 60-inches above the floor level. The systems shall activate an emergency shutdown. All gas delivery system functions and smoke machine operation must cease. A full cycle purge shall

then activate automatically through interlocks in the safety system and provide compartment ventilation until the temperature is reduced below the warning point.

c. The 15.5 inch touchpanel shall include a full color temperature over time line graph showing real time data for ALL gas sensors. Data shall be recorded as well.

6. The system shall include an exhaust ventilation system. The exhaust system shall be designed to remove heat and by product of combustion from the training environment. The system design shall provide for a compartment air exchange every 60 seconds. The system shall be programmed upon start-up of the equipment, the facility shall begin to exchange air and establish a safe training environment. Upon a system safety fault (over temperature, high gas level, system malfunction status) or manual activation of an emergency stop, automatic activation of the exhaust system shall initiate. The purge cycle shall continue until predetermined safety levels have been reached and reset. Safety reset parameters shall insure that a complete air exchange is provided prior to reactivation of the training equipment. This system shall include fan controls. The ventilation system shall be interlocked with the fire generation control system so that a failure of the ventilation system shall inhibit the operation of the main burners of the related burn props in the space that the ventilation system serves. The exhaust ventilation system shall be monitored for operation using an airflow sensor or other method of ensuring that a failure of the exhaust ventilation system is sensed by the fire generation control system.
7. The system shall include forced combustion air for each training fire. Combustion air shall be brought in from outside of the burn room (no exceptions). Systems that only move air from within the burn room and do not have an outside electronic forced air combustion system shall be deemed unsafe and unacceptable. Combustion airflow or pressure shall be proven and interlocked with the safety shutoff valves so that fuel gas cannot be admitted prior to establishment of combustion air and so that the gas is shut off in the event of combustion air failure
8. The system shall include a high gas pressure sensor that is interlocked into the trainer control system and results in an automatic safety shutdown if high gas pressure is detected.
9. Independent constant monitoring of flame propagation at each pilot burner shall be supplied. The pilot burner shall be designed to be inextinguishable. In the event that there is a failure of adequate pilot flame production, the fuel delivery system and all inline safety valves, shall close. Display status messaging shall activate on the HMI (Human-Machine Interface) touch panel screen. Pilot verification shall be completed through an ionization method. The system shall not rely on thermocouple or ultraviolet sensors for pilot flame verification.
10. The fuel delivery system shall be installed within an approved cabinet. The fuel delivery system shall be equipped with fail-safe, safety shutoff valves that are UL listed and FM approved for gas use. All gas pipe installation shall be compliant with NFPA 54 and 58. The fuel delivery system shall utilize stainless steel piping.
11. All electronic components shall be UL listed for the application in which they are utilized. Control panels shall be designed, manufactured and certified to UL 508A compliance. The NEC (NFPA 70) shall be utilized for all electrical installations.
12. All live fire props shall be controlled via Wireless Remote Pendant Controller. The controller, at minimum, must include the following operational and safety features:
    a. Deadman Activation
    b. Emergency off
    c. Fire enable
    d. Independent pilot burner flame activation
    e. Independent main burner flame intensity control
    f. Smoke Generation

g. System Reset
h. Recharge batteries
i. Wireless charging
j. G-Force shock detection with disable
k. LED lights that indicate status such as low battery

13. The system shall include multiple levels of operator password protection. Each level shall provide varied levels of operator access. The system administrator level shall allow access by the fire agency to create and assign training officers to the varied levels of system operation.
14. The system shall include data tracking and system monitoring of all system functions. Functions stored shall include operator commands as well as PLC functions and safety device inputs. Recording data must include password logging, event messaging, system messaging, alarm messaging, operator display notes, run timers and counters and fault counters. All operation events shall be stored for retrieval. The information shall be stored in the hard drive of the operating system in addition to a compact flash card that can be removed for data retrieval. The information shall be viewable from the main operator control screen at any time by selecting the appropriate icon on the 15.5 inch full color touch panel interface.
    a. Information shall be tracked by time, date, event, and action. Each log shall be designated by a number for file retrieval. The system shall integrate data tracking within the industrial operating system and not require the use of additional external equipment for data removal, viewing or storage.
    b. A minimum of (10) unique instructor logins and passwords shall be available within the system and username and passwords shall be created in under 30 seconds each at the 15.5 inch touch panel without any special programming.
15. The operating system must have remote access capabilities. The manufacture shall include a remote diagnostic program for internet servicing and system upgrades as they are available.
16. A fully integrated sound generation system shall automatically produce ambient, fire-crackling sounds upon initiation of the main fire by the operator with no further action required beyond lighting the main flame. Once fires are extinguished, the ambient, fire-crackling sound shall stop emitting automatically. Additionally, search and rescue sounds may be triggered by the wireless remote to enhance training. The sound library must be presented with the offeror's proposal. Sounds must be capable of being changed by the Owner easily. All speakers must be waterproof and include a protective corrosion-resistant cover. All signal wiring, speakers, covers, main control panel, wireless, and sounds library is the responsibility of the fire training equipment supplier.
    a. Each burn room shall have its own dedicated speaker. Additionally, 6 speakers through the building shall be installed.
17. Training fires and effect fires shall be operator controlled. The control system shall, however, automatically monitor all trainer safety systems, and shall stop all training fires and begin building ventilation as appropriate for the specific safety system alarm or malfunction.
18. The system shall include an audible fault alarm to signal to the operator that a system error has occurred. System error messages shall be visible on the main system control panel.

2.5 CLASS 'A' FIRE SIMULATED EQUIPMENT

A. Class 'A' ST SUV Trainer/Prop
1. Description: Shall represent a mid-sized SUV; capable of accepting Class 'A' combustibles in burn cribs/containment areas including engine compartment, passenger compartment, and rear storage area with lift gate; allows for multiple fire scenarios including engine fire, passenger compartment fire,

rear storage area fire, trunk fire, and fully involved fire (combination of some or all burn cribs/containment areas).
   a. All fire areas shall have steel trays with casters, positioned on ground capable of capturing and removing of all ash from the burn crib/containment area.
2. Overall Dimensions of Prop:
   a. Length: Not more than 13.5 feet long
   b. Width: Not more than 5.5 feet wide
   c. Height: Not more than 5.75 feet tall
   d. Weight: Approximately 2,200 lbs.
3. The prop shall be equipped with functioning doors (driver and passenger), hood with hood supports, lift gate with supports, dashboard, steering wheel, simulated tires, simulated engine block, simulated front bucket seats, and simulated rear bench seat.
   a. The hood and lift gate shall have a realistic weight (comparable to a real vehicle) such that they can be operated by the trainees and simulate actual conditions.
4. Fabrication
   a. The prop shall be fabricated from heavy gage, square tube frame structure and exterior steel skin of 3/16 inch steel.
   b. The prop shall be provided with heavy duty, high quality steel casters allowing for prop relocation without lifting.
   c. The prop shall be fabricated such that the frame rails, bumpers, and wheels can accept chocks and cribbing for vehicle stabilization.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to shipping the system and equipment to the site, perform a final site inspection to determine the readiness of the work to accept the system. The fire training system supplier shall be responsible for all costs associated with shipping and freight of their equipment.

B. Do not begin installation until substrates have been properly constructed and prepared.

C. If substrate preparation is the responsibility of another installer, notify the Architect in writing of unsatisfactory preparation before proceeding.

D. Start of work of this section shall be acceptance of substrates.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions, approved submittals and in proper relationship to adjacent construction.

B. The fire training system supplier shall manufacture, provide, install, integrate and test the live fire training system defined in this specification.

C. The fire training system supplier shall provide and extend gas supply from noted points of connection to terminus points as required for operation of the fire training equipment.

D. The fire training equipment supplies shall provide an initial supply of five (5) gallons of glycol (water-based) smoke fluid.

3.3 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. The fire training system supplier shall conduct an operational readiness test with facility personnel in observance. The goal of this test shall be to show reliable operation of the system. Once this test has been completed the system shall be signed off by the Owner and be officially designated ready for training (RFT).

3.4 SYSTEM STARTUP

A. Manufacturer Services: Provide services of manufacturer's field representative to perform systems startup.

B. Conduct an operational readiness test with facility personnel in observance. The goal of this test shall be to show reliable operation of the system. Once this test has been completed the system shall be signed off by the Owner and be officially designated ready for training (RFT).

3.5 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean products in accordance with manufacturers written instructions and recommendations.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for additional submittals.

B. See Section 01 7900 - Demonstration and Training for additional requirements.

C. Demonstrate operation of equipment to Owner's designated representative.

D. Training: Train Owner's personnel on operation and maintenance of system.
1. Accommodate up to 10 attendees.
2. Training Reference: Operation and maintenance manual and additional training materials as required.
3. Provide minimum of one day of training.
4. Instructor: Manufacturer's training personnel.
5. Location: Project Site.
6. Training Course shall include at a minimum the following:
    a. Overview of each prop system and its functions.
    b. Review of manuals and Equipment literature.
    c. Complete Hands-On Live Fire Prop Operation.
    d. Daily, weekly and monthly maintenance.
    e. Basic troubleshooting.
    f. Equipment replacement such as burners, sensors and devices.

g. What to do when system fails.

3.7 PROTECTION

A. Protect installed equipment and materials from subsequent construction operations.

B. Touch-up, repair or replace damaged products prior to Substantial Completion.

3.8 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Provide one (1) year of annual maintenance consisting of single preventative maintenance visit. This maintenance does not serve as a substitute for the operational and preventive maintenance that is to be performed by the Owner. This maintenance shall be performed starting one (1) year after the date of Owner acceptance.

END OF SECTION 11 6733

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SECTION 130010 - SPECIAL CONSTRUCTION – SITE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SCOPE

A. This shall include all material, hardware, equipment, and all labor necessary to complete the installation of the items defined herein.

1.3 METHODS OF MEASUREMENT AND PAYMENT

A. This work shall be measured and paid for at the Contract Price for each individual item of Special Construction, acceptability completed in accordance with these specifications.

1.4 CONSTRUCTION REQUIREMENTS

A. 130010-001 Bollard

Supply and install bollards in accordance with the contract drawings and documents including excavation, concrete foundation, and full installation.

Bollard to be Schedule 40 steel pipe filled with concrete and domed on top for drainage.

1. Size: 6” Dia. X 42” (High Above Ground)
2. Color: Yellow (Painted or with fitted bollard cover)
3. Anchor Method: Concrete filled Steel Pipe extended minimum 2’-6” below ground, which is placed in the center of a 2’-0” diameter concrete footing that extends from the ground surface to a minimum of 1’-0” below the bottom of the steel pipe, i.e. a minimum of 3’-6” from ground surface to bottom of concrete footing.
4. Material: Schedule 40 steel pipe filled with concrete and concrete footing.

Install per drawing details. Excavation, painting of bollard or bollard cover, and concrete are incidental to this item.

B. 130010-002 Planting Soil Media

All work necessary supply and install planting soil media in accordance with as indicated and as shown on the contract drawings. Planting soil media consists of well blended sandy loam topsoil consisting of 50% sand, 30% native topsoil, and 20% organic material (compost). Planting soil media to be applied to the areas specified on the contract drawings at the specified depths. Planting soil media should be free of subsoil, clay lumps, brush, roots, weeds, and any other foreign matter. The sand being used in the planting soil media mixture should be washed, course, sharp sand per ASTM C-33. Sand shall never be a contractor building sand. Product submittals are required. The over-excavation, placement, spreading, and tilling of the soils are incidental to this item. Account for proposed elevations during preliminary site grading.

Contractor to place planting soil media to avoid compaction of the planting soil media by methods including low-compaction earth moving equipment, by using placement equipment outside of the

planting soil media area, or other means to avoid compaction including hand placement if necessary.

Contractor to provide product submittal of compost and sand to Engineer prior to procurement to ensure mixture complies with product specifications. Engineer must be notified 48 hours before critical stages of BMP implementation as indicated on the contract drawings to witness the work.

C. 130010-003 Tree Protection Fence

All work necessary to supply and install tree protection fence as indicated and as shown on the contract drawings. Tree protection fence shall be 4' high standard orange safety fence. Fence stakes can be wooden stakes, metal T-post, plastic posts or rebar. Stakes shall be driven into the ground at least 18-inches and fence shall be fastened to each post. If rebar posts are used, tops of all rebar posts shall be capped with orange rebar safety cap. All items including stakes, rebar safety caps, ties or any other material required to fasten fence to posts are considered incidental to this item. Maintenance or replacement of fence is also considered incidental to this item. If fence is knocked over, it shall be repaired or replaced within 24 hours.

END OF SECTION 130010

SECTION 13 3419 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Metal wall and roof panels including soffits and gutters and downspouts.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between accessory components and wall system.

1.3 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

G. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

I. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

J. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel.

P. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems.

Q. MBMA (MBSM) - Metal Building Systems Manual.

R. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
1. Steel Framing and Girts: Provide data on profiles, component dimensions, and fasteners.
2. Structural and Non-structural Paneling: Provide data on wall panels, roof panels, liner panels, fasteners, and accessories.
3. Metal Trim and Roof Drainage Components: Provide data on wall trim (inside corners, outside corners, perimeter caps/channels/closures), opening trim (doors, windows, louvers, cased openings, roof trim (fascia, rake, drip edge), gutters, downspouts, and other trim components, fasteners, and accessories

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, and loads; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation and pier system configuration, general construction details, dimensions, loading, reinforcing sizes, reinforcing layout/locations, anchor bolts, and installation; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

D. Samples: Submit two samples of precoated metal panels for each color selected, panel width by 12 inch in size illustrating color and texture of finish.

E. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

F. Designer's Qualification Statement.

G. Manufacturer's Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary

members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

H. Erector's Qualification Statement.

I. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

J. Project Record Documents: Record actual locations of concealed components and utilities.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.
   1. Design Engineer Qualifications: Licensed in the State in which the Project is located.
   2. Comply with applicable codes and AHJ requirements for submission of design calculations and reviewed shop and erection drawings as required for acquiring permits.
   3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).
   1. Maintain one copy on site.

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than 10 years of documented experience.
   2. Accredited by IAS in accordance with IAS AC472.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

E. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 ASSEMBLIES

A. Truss frame.

B. Primary Framing: Rigid frame of rafter beams and columns, end wall columns, and wind bracing.

C. Secondary Framing: Purlins, Girts, Eave struts, Flange bracing, Sill supports, and Clips, and other items detailed.

D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly and liner sheets, and accessory components.

E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly and liner panels, and accessory components.

F. Roof Slope: 2 inches in 12 inches.

2.2 PERFORMANCE REQUIREMENTS

A. Design structural members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable codes, AHJ requirements, and design load schedule .

B. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/180 of span.

C. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

D. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

E. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

2.3 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Structural Tubing: ASTM A500/A500M Grade B cold-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM A307, Grade A, with mechanically deposited type or hot dip type for protective coatings.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

F. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.

G. Primer: SSPC-Paint 20 zinc rich.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.
   3. Height Change, Plastic State: When tested in accordance with ASTM C827/C827M:

a. Maximum: Plus 4 percent.
b. Minimum: Plus 1 percent.

2.4 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

B. Steel Sheet: ASTM A792/A792M aluminum-zinc alloy coated to AZ50/AZM150.

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

E. Bituminous Paint: Asphaltic type.

F. Sealant: Manufacturer's standard type.

G. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Rain Water Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.5 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

C. Provide wall opening framing for cased openings or other accessory components.

2.6 FABRICATION - WALL AND ROOF PANELS

A. Siding: Manufacturer's minimum metal thickness required to comply with loading requirements and framing configuration, vertical ribbed profile, 1-1/2 inch deep, lapped edges fitted with continuous gaskets.

B. Roofing: Manufacturer's minimum metal thickness required to comply with loading requirements and framing configuration, flat panel with vertical standing seam (BOD: Architectural Profile) profile, lapped edges fitted with continuous gaskets.

C. Liner: Manufacturer's minimum metal thickness required to comply with loading requirements and framing configuration, flat profile, lapped V edges.

D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

E. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners.

F. Expansion Joints: Same material and finish as adjacent material where exposed, manufacturer's standard brake formed type, of profile to suit system.

G. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.7 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form gutters and downspouts of rectangular profile and size to collect and remove water. Fabricate with connection pieces.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

D. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.8 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall and Roof Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

C. Interior Surfaces of Wall and Ceiling Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.2 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.4 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Apply bituminous paint on surfaces in contact with cementitious materials.

C. Slope gutters minimum 1/8 inch/ft.

3.5 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Install cased openings in accordance with manufacturer's instructions.

3.6 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION 13 3419

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SECTION 211300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.2 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

F. ITS (DIR) - Directory of Listed Products; current edition.

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 1963 - Standard for Fire Hose Connections; 2014.

I. UL (DIR) - Online Certifications Directory; Current Edition.

J. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.

2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.

3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements for additional provisions.

2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.

3. Sprinkler Wrenches: For each sprinkler type.

1.5 QUALITY ASSURANCE

A. Comply with FM (AG) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineeror NICET Level III designer experienced in design of this type of work and licensed in the State of Maryland.

C. Equipment and Components: Provide products that bear FM (AG) label or marking.

D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:

1. Tyco Fire Protection Products: www.tyco-fire.com/#sle.

2. Viking Corporation: www.vikinggroupinc.com/#sle.

3. Substitutions: See Section 016000 - Product Requirements.

B. UL Listed for Fire Protection Services

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Interface system with building fire and smoke alarm system.

C. Provide fire department connections where indicated.

2.3 SPRINKLERS

A. Exposed Area Type: Standard upright type with guard (where sprinkler is lower than seven feet above finished floor

1. Response Type: Quick.

2. Coverage Type: Standard.

B. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.

1. Response Type: Quick.

2. Coverage Type: Standard.

3. Finish: Brass.

4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Guards: Finish to match sprinkler finish.

2.4 PIPING SPECIALTIES

A. Fire Department Connections:

1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.

a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.

b. Configuration: Horizontal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Flush entire piping system of foreign matter.

G. Install guards on sprinklers in exposed ceilings where less than seven feet above finished floor..

H. Hydrostatically test entire system.

END OF SECTION 211300

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.

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.

a. 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. ABS Piping: ASTM D 2235.

2. CPVC Piping: ASTM F 493.

3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

4. PVC to ABS Piping Transition: ASTM D 3138.

5. 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.

2.3 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. 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.

2.4 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.

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. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

5. PVC Nonpressure Piping: Join according to ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure 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 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 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.

END OF SECTION 220500 220500

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tags.

B. Pipe markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

2.2 IDENTIFICATION APPLICATIONS

A. Piping: Tags.

B. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.3 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.4 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

D. Identification Scheme, ASME A13.1:

E. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

2. Flammable Fluids: Yellow with black letters.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install tags with corrosion resistant chain.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

E. Use tags on piping 3/4 inch (20 mm) diameter and smaller.

1. Identify service, flow direction, and pressure.

2. Install in clear view and align with axis of piping.

3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 220553

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Comply with standards of authorities having jurisdiction for fire-suppression water- service piping, including materials, hose threads, installation, and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire- service-main products.

F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

G. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF- pw" on piping.

2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of water-distribution service without Construction Manager's and Owner's written permission.

1.5 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Gaskets: AWWA C111, rubber.

2.2 JOINING MATERIALS

A. Refer to Division 22 Section "Common Work Results for Plumbing" for commonly used joining materials.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

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:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. American AVK Co.; Valves & Fittings Div.

b. American Cast Iron Pipe Co.; American Flow Control Div.

c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.

d. Crane Co.; Crane Valve Group; Stockham Div.

e. East Jordan Iron Works, Inc.

f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).

g. McWane, Inc.; Kennedy Valve Div.

h. McWane, Inc.; M & H Valve Company Div.

i. McWane, Inc.; Tyler Pipe Div.; Utilities Div.

j. Mueller Co.; Water Products Div.

k. NIBCO INC.

l. U.S. Pipe and Foundry Company.

4. Nonrising-Stem, Metal-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

1) Standard: AWWA C500.

2) Minimum Pressure Rating: 200 psig.

3) End Connections: Mechanical joint.

4) Interior Coating: Complying with AWWA C550.

5. Nonrising-Stem, Resilient-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509.

2) Minimum Pressure Rating: 200 psig.

3) End Connections: Mechanical joint.

4) Interior Coating: Complying with AWWA C550.

6. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:

a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509.

2) Minimum Pressure Rating: 250 psig.

3) End Connections: Push on or mechanical joint.

4) Interior Coating: Complying with AWWA C550.

7. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

    a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

        1) Standard: AWWA C500.

    b. Minimum Pressure Rating: 200 psig.

        1) End Connections: Flanged.

8. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

    a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

        1) Standard: AWWA C509.

        2) Minimum Pressure Rating: 200 psig.

        3) End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:

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:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. American Cast Iron Pipe Co.; American Flow Control Div.

    b. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.

    c. Crane Co.; Crane Valve Group; Stockham Div.

    d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).

    e. McWane, Inc.; Kennedy Valve Div.

    f. McWane, Inc.; M & H Valve Company Div.

    g. Mueller Co.; Water Products Div.

    h. NIBCO INC.

    i. U.S. Pipe and Foundry Company.

4. UL/FMG, Nonrising-Stem Gate Valves:

    a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

        1) Standards: UL 262 and FMG approved.

        2) Minimum Pressure Rating: 175 psig.

        3) End Connections: Flanged.

5. OS&Y, Rising-Stem Gate Valves:

    a. Description: Iron body and bonnet and bronze seating material.

        1) Standards: UL 262 and FMG approved.

        2) Minimum Pressure Rating: 175 psig.

        3) End Connections: Flanged.

C. Bronze Gate Valves:

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:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.

    b. Crane Co.; Crane Valve Group; Jenkins Valves.

    c. Crane Co.; Crane Valve Group; Stockham Div.

    d. Hammond Valve.

    e. Milwaukee Valve Company.

    f. NIBCO INC.

    g. Red-White Valve Corporation.

4. OS&Y, Rising-Stem Gate Valves:

    a. Description: Bronze body and bonnet and bronze stem.

1) Standards: UL 262 and FMG approved.

2) Minimum Pressure Rating: 175 psig.

3) End Connections: Threaded.

5. Nonrising-Stem Gate Valves:

a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

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:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.

b. East Jordan Iron Works, Inc.

c. Flowserve.

d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).

e. McWane, Inc.; Kennedy Valve Div.

f. McWane, Inc.; M & H Valve Company Div.

g. Mueller Co.; Water Products Div.

h. U.S. Pipe and Foundry Company.

4. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.

b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

F. Aboveground and Vault Water-Service Piping NPS 3/4 to NPS 3 shall be hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

3.2 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, high- pressure, resilient-seated gate valves with valve box.

2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.

3. Use the following for valves in vaults and aboveground:

   a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.

   b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.

3.3 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.

2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.

3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

D. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

1. Make connections NPS 2 and smaller with drilling machine according to the following:

2. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.

3. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.

4. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.

5. Install corporation valves into service-saddle assemblies.

6. Install manifold for multiple taps in water main.

7. Install curb valve in water-service piping with head pointing up and with service box.

E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

F. Install PE pipe according to ASTM D 2774 and ASTM F 645.

G. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

H. Bury piping with depth of cover over top at least 30 inches.

I. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

J. Sleeves are specified in Division 22 Section "Common Work Results for Plumbing."

K. Mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

L. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.4 JOINT CONSTRUCTION

A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.

2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved- end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.

5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 22 Section "Common Work Results for Plumbing" for joining piping of dissimilar metals.

3.5 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.

2. Locking mechanical joints.

3. Set-screw mechanical retainer glands.

4. Bolted flanged joints.

5. Heat-fused joints.

6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.

3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.6 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.7 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install protective pipe bollards on three sides of each fire department connection. Pipe bollards are specified in Division 05 Section "Metal Fabrications."

3.8 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. See Division 22 Section "Common Work Results for Plumbing" for piping connections to valves and equipment.

C. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve or service clamp and corporation valve as required on drawings.

D. Connect water-distribution piping to interior domestic water piping.

E. Connect waste piping from concrete vault drains to sanitary sewerage system. See Division 22 Section "Facility Sanitary Sewers" for connection to sanitary-sewer piping.

3.9 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.10 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Division 22 Section "Common Work Results for Plumbing" for identifying devices.

3.11 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

END OF SECTION 221113 221113

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 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.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 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. Include marking "NSF-pw" on piping.

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 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.

5. Copper Pressure-Seal-Joint Fittings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Elkhart Products Corporation; Industrial Division.

2) NIBCO INC.

3) Viega; Plumbing and Heating Systems.

b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

6. Copper Push-on-Joint Fittings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) NVent LLC.

b. Description: Cast-copper fitting complying with ASME B16.18 or wrought- copper fitting complying with ASME B 16.22; with stainless-steel teeth and EPDM-rubber O-ring seal in each end instead of solder-joint ends.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2. Copper Pressure-Seal-Joint Fittings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Elkhart Products Corporation; Industrial Division.

2) NIBCO INC.

3) Viega; Plumbing and Heating Systems.

b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

c. NPS 3 and NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O- ring seal in each end.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Standard-Pattern, Push-on-Joint Fittings: AWWA C110, ductile or gray iron.

a. Gaskets: AWWA C111, rubber.

2. Compact-Pattern, Push-on-Joint Fittings: AWWA C153, ductile iron.

a. Gaskets: AWWA C111, rubber.

2.4 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.

2.5 TRANSITION FITTINGS

A. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

B. Sleeve-Type Transition Coupling: AWWA C219.

C. Plastic-to-Metal Transition Fittings:

1. Description: CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:

1. Description: CPVC or PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint plastic end, rubber O-ring, and union nut.

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: 250 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: 175 psig minimum.
    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 250 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 250 psig.

2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.

3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

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 ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. PVC/CPVC/ABS PIPING SHALL NOT BE INSTALLED IN ENVIRONMENTAL AIR PLENUMS UNLESS IT HAS A 25/50 FLAME/SMOKE RATING OR IS INSULATED AND THE INSULATION HAS A 25/50 FLAME/SMOKE RATING.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

H. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

I. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

J. Install seismic restraints on piping. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

K. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

L. 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.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping adjacent to equipment and specialties to allow service and maintenance.

O. Install piping to permit valve servicing.

P. 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.

Q. Install piping free of sags and bends.

R. Install fittings for changes in direction and branch connections.

S. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

T. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

U. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

V. Install thermometers on outlet piping from each 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. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. 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.

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. Apply primer.

2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

J. 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 or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

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 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. 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 PipingNPS 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 or nipples unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 to NPS 6: Use dielectric flange kits.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster 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 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. 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.

c. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. 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.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.

2. NPS 1-1/2: 108 inches with 3/8-inch rod.

3. NPS 2: 10 feet with 3/8-inch rod.

4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.

J. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

K. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

L. Install hangers for vertical PEX piping every 48 inches.

M. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

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. Domestic Water Booster Pumps: Cold-water suction and discharge piping.

2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. 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.

4. 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 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.

3.11 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.

3.12 CLEANING

A. Clean and disinfect potable and non-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.

3.13 PIPING SCHEDULE

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 copper tube, ASTM B 88, Type L; wrought-copper solder-joint fittings; and brazed joints.

2. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.

2. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper pressure-seal- joint fittings; and pressure-sealed joints.

3. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper push-on-joint fittings; and push-on joints.

3.14 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

D. CPVC and PVC valves matching piping materials may be used.

END OF SECTION 221116 221116

SECTION 231126 - FACILITY LIQUEFIED-PETROLEUM GAS PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for propane gas piping systems.

1.2 RELATED REQUIREMENTS

A. Section 230516 - Expansion Fittings and Loops for HVAC Piping.

1.3 REFERENCE STANDARDS

A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2023.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

C. ASME B31.1 - Power Piping; 2024.

D. ASME B31.9 - Building Services Piping; 2025.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.

G. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

H. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

I. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

J. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

K. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

N. NFPA 58 - Liquefied Petroleum Gas Code; 2024, with Amendment.

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

C. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 PROPANE GAS PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2. Joints: ASME B31.1, welded.

B. Flexible Gas Piping:

1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.

2. Fittings: Provided by piping system manufacturer.

2.2 PROPANE GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Joints: NFPA 58, threaded or welded to ASME B31.1.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:

2.4 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure.

4. Vertical Pipe Support: Steel riser clamp.

B. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.5 BALL VALVES

A. Construction, 2 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, brass, bronze, or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blowout proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

2.6 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

A. Compliance Requirements:

B. Materials in Contact With Gas:

C. Maximum Inlet Operating Pressure: 10 psi (68.9 kPa).

1. Appliance Regulator: 10 psi (68.9 kPa).

2. Line Pressure Regulator: 10 psi (68.9 kPa).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 230516.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

H. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

I. Sleeve pipes passing through partitions, walls and floors.

J. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.

2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.

3. Place hangers within 12 inches (300 mm) of each horizontal elbow.

4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

5. Support vertical piping at every ____ floor. Support riser piping independently of connected horizontal piping.

6. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

END OF SECTION 231126

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Underground feeder and branch-circuit cable.

C. Service entrance cable.

D. Metal-clad cable.

E. Wire and cable for 600 volts and less.

F. Wiring connectors.

G. Electrical tape.

H. Heat shrink tubing.

I. Oxide inhibiting compound.

J. Wire pulling lubricant.

K. Cable ties.

L. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 260533.13 - Conduit for Electrical Systems: Additional installation requirements for cables installed in conduit systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

J. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

L. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2024.

M. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

N. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

Q. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

U. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

V. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

W. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Concealed Dry Interior Locations: Use only building wire in raceway or metal clad cable.

D. Exposed Dry Interior Locations: Use only building wire in raceway.

E. Above Accessible Ceilings: Use only building wire in raceway or metal clad cable.

F. Wet or Damp Interior Locations: Use only building wire with Type UF insulation in raceway.

G. Exterior Locations: Use only building wire with Type THWN-2 insulation in raceway.

H. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

I. Use stranded conductors for control circuits.

J. Use conductor not smaller than 12 AWG for power and lighting circuits.

K. Use conductor not smaller than 14 AWG for control circuits.

L. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (25 m).

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.

a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:

1) Services: Copper conductors size 1/0 AWG and larger.

2) Feeders: Copper conductors size 1/0 AWG and larger.

b. Where aluminum conductors are substituted for copper, comply with the following:

1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.

2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.

3) Provide aluminum equipment grounding conductor sized according to NFPA 70.

4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

J. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.

2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

c. Travelers for 3-Way and 4-Way Switching: Pink.

d. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com/#sle.

b. Encore Wire Corporation: www.encorewire.com/#sle.

c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.

d. Southwire Company: www.southwire.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

a. Size 4 AWG and Larger: Type XHHW-2.

b. Installed Underground: Type XHHW-2.

c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

F. Conductor: Copper.

G. Insulation Voltage Rating: 600 volts.

H. Insulation: NFPA 70 , Type THHN/THWN.

I. Insulation: Thermoplastic material rated 75 degrees C.

2.4 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.

B. Provide equipment grounding conductor unless otherwise indicated.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.

2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Cable Jacket: Listed and labeled as sunlight resistant.

2.5 METAL-CLAD CABLE

A. Manufacturers:

1. AFC Cable Systems Inc: www.afcweb.com/#sle.

2. Encore Wire Corporation: www.encorewire.com/#sle.

3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.

2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Steel, interlocked tape.

I. Description: NFPA 70, Type MC.

J. Conductor: Copper.

K. Insulation Voltage Rating: 600 volts.

L. Insulation Temperature Rating: 75 degrees C.

M. Insulation Material: Thermoplastic.

N. Armor Material: Steel.

O. Armor Design: Interlocked metal tape.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

3. Connectors for Aluminum Conductors: Use compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.

5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.

7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.7 ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

a. 3M: www.3m.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.

5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).

6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

F. Install metal-clad cable (Type MC) in accordance with NECA 120.

G. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

H. Exposed Cable Installation (only where specifically permitted):

1. Route cables parallel or perpendicular to building structural members and surfaces.

2. Protect cables from physical damage.

I. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

J. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

K. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):

a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

L. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

M. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.

N. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

O. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

P. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

Q. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

R. Insulate ends of spare conductors using vinyl insulating electrical tape.

S. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

T. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment.

U. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

V. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

W. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

X. Route wire and cable as required to meet project conditions.

1. Wire and cable routing indicated is approximate unless dimensioned.

2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

Y. Use wiring methods indicated.

Z. Pull all conductors into raceway at same time.

AA. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

BB. Protect exposed cable from damage.

CC. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.

DD. Use suitable cable fittings and connectors.

EE. Neatly train and lace wiring inside boxes, equipment, and panelboards.

FF. Clean conductor surfaces before installing lugs and connectors.

GG. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

HH. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

II. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

JJ. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

KK. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 014000.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

E. Correct deficiencies and replace damaged or defective conductors and cables.

F. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Grounding and bonding components.

G. Provide all components necessary to complete the grounding system(s) consisting of:

1. Existing metal underground water pipe.

2. Metal underground water pipe.

3. Metal frame of the building.

4. Metal underground gas piping system.

5. Rod electrodes.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

1. Includes oxide inhibiting compound.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 033000 - Cast-in-Place Concrete.

D. Section 263100 - Photovoltaic Collectors: Additional grounding and bonding requirements for photovoltaic systems.

E. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2025.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:

a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

5. Ground Rod Electrode(s):

a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.

c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

a. Ground Bar Size: 1/4 by 4 by 12 inches (6 by 100 by 300 mm) unless otherwise indicated or required.

b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

a. Transformers (except autotransformers such as buck-boost transformers).

2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.

5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

    b. Metal gas piping.

8. Provide bonding for metal building frame.

9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

I. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.

    b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.

    c. Ground Bar Size: 1/4 by 4 by 12 inches (6 by 100 by 300 mm) unless otherwise indicated or required.

d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

J. Photovoltaic Systems: Also comply with Section 263100.

K. Pole-Mounted Luminaires: Also comply with Section 265600.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

F. Oxide Inhibiting Compound: Comply with Section 260519.

2.3 MANUFACTURERS

A. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.

B. Substitutions: See Section 016000 - Product Requirements.

2.4 ELECTRODES

A. Manufacturers:

1. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.

2. Substitutions: See Section 016000 - Product Requirements.

B. Rod Electrodes: Copper-clad steel.

1. Diameter: 3/4 inch (19 mm).

2. Length: 10 feet (3000 mm).

3. Substitutions: See Section 016000 - Product Requirements.

2.5 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

F. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

G. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

H. Provide bonding to meet requirements described in Quality Assurance.

I. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Conduit and equipment supports.

G. Anchors and fasteners.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: Comply with Section 260548.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Comply with MFMA-4.

2. Channel Material:

    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.

    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:

a. Equipment Supports: 1/2 inch (13 mm) diameter.

b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.

c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.

d. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.

e. Outlet Boxes: 1/4 inch (6 mm) diameter.

f. Luminaires: 1/4 inch (6 mm) diameter.

G. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Wood: Use wood screws.

8. Plastic and lead anchors are not permitted.

9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

a. Comply with MFMA-4.

b. Channel Material: Use galvanized steel.

c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

2.2 MANUFACTURERS

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

C. Substitutions: See Section 016000 - Product Requirements.

2.3 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:

ANCHOR HARDWARE TABLE

D. Formed Steel Channel:

1. Product: Steel "U" shaped with in-turned clamping ridges manufactured by Unitstrut, Power Wtrut, B-Line Strut or Kindorf.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide required vibration isolation and/or seismic controls in accordance with Section 260548.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: Also comply with Section 260533.13.

J. Box Support and Attachment: Also comply with Section 260533.16.

K. Interior Luminaire Support and Attachment: Also comply with Section 265100.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners according to manufacturer's recommended torque settings.

N. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

E. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

2. Do not drill or cut structural members.

F. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors.

H. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1-5/8" off wall.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 260529

SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible metal conduit (FMC).

B. Liquidtight flexible metal conduit (LFMC).

C. Electrical metallic tubing (EMT).

D. Rigid polyvinyl chloride (PVC) conduit.

E. Liquidtight flexible nonmetallic conduit (LFNC).

F. Conduit fittings.

G. Accessories.

H. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 078400 - Firestopping.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260533.16 - Boxes for Electrical Systems.

G. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

H. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

I. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

J. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

N. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

D. Embedded Within Concrete:

1. Within Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

2. Within Slab Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

3. Where electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

b. Where exposed below 20 feet (6.1 m) in warehouse areas.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.

1. Maximum Length: 6 feet (1.8 m).

N. Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit.

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.

3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.

4. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

c. Genset.

d. Mechanical HVAC equipment

O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.2 CONDUIT REQUIREMENTS

A. Electrical Service Conduits: Also comply with Section 262100.

B. Communications Systems Conduits: Also comply with Section 271000.

C. Fittings for Grounding and Bonding: Also comply with Section 260526.

D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.

2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.

3. Control Circuits: 1/2 inch (16 mm) trade size.

4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.

5. Underground, Interior: 3/4 inch (21 mm) trade size.

6. Underground, Exterior: 1 inch (27 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. _____.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

   a. Do not use die cast zinc fittings.

4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

1. Manufacturers:

   a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

   b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

   c. Thomas & Betts Corporation: www.tnb.com/#sle.

   d. Substitutions: See Section 016000 - Product Requirements.

2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

D. Conduit Size: Comply with NFPA 70.

1. Minimum Size: 3/4 inch (19 mm) unless otherwise specified.

E. Outdoor Locations Above Grade: Use rigid steel conduit.

F. In Slab Above Grade:

1. Use rigid steel conduit.

2. Maximum Size Conduit in Slab: 3/4 inch (19 mm); 1/2 inch (13 mm) for conduits crossing each other.

G. Wet and Damp Locations: Use rigid steel conduit.

H. Dry Locations:

1. Concealed: Use electrical metallic tubing, where permitted by the NEC.

2. Exposed: Use electrical metallic tubing, where permitted by the NEC.

2.5 METAL CONDUIT

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedtube.com.

2. Wheatland Tube Company: www.wheatland.com.

3. Triangle

4. Substitutions: See Section 016000 - Product Requirements.

B. Rigid Steel Conduit: ANSI C80.1.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.6 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Thomas & Betts Corporation; _____: www.tnb.com/#sle.

2. Robroy Industries; _____: www.robroy.com/#sle.

3. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).

D. PVC-Coated Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).

E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.7 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, Inc; _____: www.afcweb.com/#sle.
2. Electri-Flex Company; _____: www.electriflex.com/#sle.
3. International Metal Hose; _____: www.metalhose.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:

1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
   b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
   c. Thomas & Betts Corporation: www.tnb.com/#sle.
   d. Substitutions: See Section 016000 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction.

E. Fittings: NEMA FB 1.

2.8 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, Inc; _____: www.afcweb.com/#sle.
2. Electri-Flex Company; _____: www.electriflex.com/#sle.
3. International Metal Hose; _____: www.metalhose.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction with PVC jacket.

E. Fittings: NEMA FB 1.

2.9 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
3. Triangle
4. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

c. Thomas & Betts Corporation: www.tnb.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

4. Connectors and Couplings: Use compression (gland) or set-screw type.

a. Do not use indenter type connectors and couplings.

5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

D. Description: ANSI C80.3; galvanized tubing.

E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:

1. Cantex Inc: www.cantexinc.com/#sle.

2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.

3. JM Eagle: www.jmeagle.com/#sle.

4. _____.

5. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.11 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

G. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal all conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

   a. Electrical rooms.

   b. Mechanical equipment rooms.

   c. Within joists in areas with no ceiling.

5. Unless otherwise approved, do not route conduits exposed:

   a. Across floors.

   b. Across roofs.

   c. Across top of parapet walls.

   d. Across building exterior surfaces.

6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.

9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.

10. Route conduits above water and drain piping where possible.

11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.

13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:

a. Heaters.

b. Hot water piping.

c. Flues.

14. Group parallel conduits in the same area together on a common rack.

H. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required vibration isolation and/or seismic controls in accordance with Section 260548.

3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

5. Use conduit strap to support single surface-mounted conduit.

a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.

7. Use conduit clamp to support single conduit from beam clamp or threaded rod.

8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

9. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).

10. Use of wire for support of conduits is not permitted.

11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

I. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

J. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Provide suitable modular seal where conduits penetrate exterior wall below grade.

7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

K. Underground Installation:

1. Provide trenching and backfilling in accordance with Section 312316.13.

2. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 36 inches (_____ mm).

b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.

3. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 033000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

P. Provide grounding and bonding in accordance with Section 260526.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Install steel conduit as specified in NECA 101.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel .

G. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Route conduit in and under slab from point-to-point.

N. Maintain adequate clearance between conduit and piping.

O. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

P. Cut conduit square using saw or pipecutter; de-burr cut ends.

Q. Bring conduit to shoulder of fittings; fasten securely.

R. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.

S. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch (50 mm) size.

T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.

V. Provide suitable pull string in each empty conduit except sleeves and nipples.

W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

X. Ground and bond conduit under provisions of Section 260526.

Y. Identify conduit under provisions of Section 260553.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Section 01700.

END OF SECTION 260533.13

SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Wall and ceiling outlet boxes.

F. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 262726 - Wiring Devices:

1. Wall plates.

2. Floor box service fittings.

3. Additional requirements for locating boxes for wiring devices.

I. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for underground handhole enclosures, underground handhole enclosures, underground handhole enclosures, and underground handhole enclosures.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.

4. Use suitable masonry type boxes where flush-mounted in masonry walls.

5. Use raised covers suitable for the type of wall construction and device configuration where required.

6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

12. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:

   a. Indoor Clean, Dry Locations: Type 1, painted steel.

   b. Outdoor Locations: Type 3R, painted steel.

3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

   a. Back Panels: Painted steel, removable.

5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.

E. Floor Boxes:

1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2. Use cast iron floor boxes within slab on grade.

3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).

4. Manufacturer: Same as manufacturer of floor box service fittings.

2.2 MANUFACTURERS

A. Appleton Electric: www.appletonelec.com.

B. Hoffman

C. Steel City

D. Crouse-Hinds

E. Substitutions: See Section 016000 - Product Requirements.

2.3 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 262726.

2.4 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

1. Material: Galvanized cast iron.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.

a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.

b. Communications Systems Outlets: Comply with Section 271000.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.

8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

    b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.

9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.

10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

    a. Concealed above accessible suspended ceilings.

    b. Within joists in areas with no ceiling.

    c. Electrical rooms.

    d. Mechanical equipment rooms.

I. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required seismic controls in accordance with Section 260548.

3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 260526.

S. Identify boxes in accordance with Section 260553.

T. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

U. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

V. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

W. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

1. Adjust box locations up to 10 feet (3 m) if required to accommodate intended purpose.

X. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

Y. Maintain headroom and present neat mechanical appearance.

Z. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

AA. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

BB. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

CC. Use flush mounting outlet box in finished areas.

DD. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

EE. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.

FF. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

GG. Do not fasten boxes to ceiling support wires.

HH. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches (305 mm) of box.

II. Use gang box where more than one device is mounted together. Do not use sectional box.

JJ. Use cast outlet box in exterior locations exposed to the weather and wet locations.

KK. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

3.3 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.5 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

B. Clean exposed surfaces and restore finish.

END OF SECTION 260533.16

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 2 PRODUCTS

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Large Device Identification.

C. Nameplates and Labels.

D. Wire and cable markers.

E. Voltage markers.

F. Underground warning tape.

G. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 260536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

E. Section 260573 - Power System Studies: Arc flash hazard warning labels.

F. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

G. Section 271000 - Structured Cabling: Identification for communications cabling and devices.

H. Section 27 10 00 - Data & Voice Communications Cabling: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

b. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

c. Time Switches:

1) Identify load(s) served and associated circuits controlled. Include location.

d. Transfer Switches:

1) Identify voltage and phase.

2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify

all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Emergency System Equipment:

   a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

   b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

   a. Service equipment.

   b. Elevator control panels.

6. Arc Flash Hazard Warning Labels: Comply with Section 260573.

C. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.

2. Identification for Communications Conductors and Cables: Comply with Section 271000.

3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

   a. At each source and load connection.

   b. Within boxes when more than one circuit is present.

   c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

D. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).

2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).

    a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.

        1) Color Code:

            a) Emergency Power System: Red.

        2) Field-Painting: Comply with Section 099123 and 099113.

        3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.

4. Use underground warning tape to identify underground raceways.

E. Identification for Cable Tray: Comply with Section 260536.

F. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use voltage markers or color coded boxes to identify systems other than normal power system.

    a. Color-Coded Boxes: Field-painted in accordance with Section 099123 and 099113 per the same color code used for raceways.

3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

    a. For exposed boxes in public areas, use only identification labels.

G. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 27 10 00.

2. Wiring Device and Wallplate Finishes: Comply with Section 262726.

3. Use identification label to identify fire alarm system devices.

4. Use identification label to identify serving branch circuit for all receptacles.

    a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Substitutions: See Section 016000 - Product Requirements.

2.3 LARGE DEVICE IDENTIFICATION

A. Identify all disconnect switches, pull boxes, junction boxes (larger than 4" X 4") in unfinished areas with Brady voltage markers, catalog #B-498, series #44xxx (xxx indicates last 3 numbers of model number which vary based on voltage, size, etc. Contractor shall coordinate this information prior to ordering). Sizes for each label shall be as large as possible, style "A", "B" or "C" as the device permits.

B. Identify all disconnect switches, pull boxes, junction boxes (larger than 4" X 4") finished with black engraved lamicoid self-adhesive labels, 1" X 4". The label shall state the power feed, circuit or section number, and the equipment identification number that the large device serves.

2.4 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:

a. Brimar Industries, Inc: www.brimar.com/#sle.

b. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.

c. Seton Identification Products; _____: www.seton.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.

4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.

5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.

6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:

a. Brady Corporation; _____: www.bradyid.com/#sle.

b. Brother International Corporation: www.brother-usa.com/#sle.

c. Panduit Corp: www.panduit.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

a. Use only for indoor locations.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).

2. Legend:

a. Equipment designation or other approved description.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

a. Equipment Designation: 1/2 inch (13 mm).

5. Color:

a. Normal Power System: White text on black background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/4 inch (6 mm).
5. Color: Black text on white background unless otherwise indicated.
    a. Exceptions:
        1) Provide white text on red background for general information or operational instructions for emergency systems.

E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

F. Format for Control Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

G. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

H. Nameplates: Engraved three-layer laminated plastic, black letters on white background, 2" by 6" in size

I. Locations:

1. Each electrical distribution and control equipment enclosure.

2. Disconnect Switches

3. Panelboards.

J. Letter Size:

1. Use 1/8 inch (3 mm) letters for identifying individual equipment and loads.

K. Labels: Embossed adhesive tape, with 3/16 inch (5 mm) white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.5 WIRE AND CABLE MARKERS

A. Manufacturers:

1. Brady Bradysleeve Catalog #B-320 PVC.

2. Substitutions: See Section 016000 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch (3 mm).

G. Color: Black text on white background unless otherwise indicated.

H. Locations: Each conductor at pull boxes, junction boxes, and Termination or connection points including each load connection.

I. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.6 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:

1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).

3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

2. Markers for System Identification:

a. Emergency Power System: Text "EMERGENCY".

E. Color: Black text on orange background unless otherwise indicated.

F. Location: Furnish markers for each conduit longer than 6 feet (2 m).

G. Spacing: 20 feet (6 m) on center.

2.7 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Brady Corporation; _____: www.bradyid.com/#sle.

2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Seton Identification Products; _____: www.seton.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Foil-backed Detectable Type Tape: 3 inches (76 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:

1. Tape for Buried Power Lines: Black text on red background.

2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.8 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conduits: Legible from the floor.
8. Boxes: Outside face of cover.
9. Conductors and Cables: Legible from the point of access.
10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 260553

SECTION 260583 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.

2. Make electrical connections before required start-up of equipment.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260533.13.

E. Wire and Cable: As specified in Section 260519.

F. Boxes: As specified in Section 260533.16.

2.2 EQUIPMENT CONNECTIONS

A. VRF UNITS

B. Unit heaters

C. DOAS Unit

D. Kitchen Exhaust Hoods

E. Kitchen Exhaust Fans

F. NO/CO systems

G. Electric Hot Water heaters

H. All electrical systems

I. All mechanical equipment stand-alone control equipment

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 260583

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose transformers.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

J. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with placement of supports, anchors, etc. required for mounting.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

C. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

D. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.

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, and installation of product.

F. Project Record Documents: Record actual locations of transformers.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. 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.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.

1. Greater than 10 kVA: 104 degrees F (40 degrees C) maximum.

2. Less than 10 kVA: 77 degrees F (25 degrees C) maximum.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Schneider Electric; Square D Products; _____: www.schneider-electric.us/#sle.

B. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

C. GE Industrial: www.geindustrial.com.

D. Substitutions: See Section 016000 - Product Requirements.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet (1,000 m).

2. Ambient Temperature:

a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).

b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.

2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

C. Coil Conductors: Continuous copper windings with terminations brazed or welded.

D. Winding Taps:

1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.

3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

F. Energy Efficiency: Standard efficiency complying with NEMA TP 1.

G. Sound Levels: Standard sound levels complying with NEMA ST 20

H. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.

2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.

3. Larger than 75 kVA: Suitable for floor mounting.

I. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor clean, dry locations: Type 1.

b. Outdoor locations: Type 3R.

2. Construction: Steel.

a. Less than 15 kVA: Totally enclosed, non-ventilated.

b. 15 kVA and Larger: Ventilated.

3. Finish: Manufacturer's standard grey, suitable for outdoor installations.

4. Provide lifting eyes or brackets.

J. Mounting:

1. Larger than 75 kVA: Suitable for floor mounting.

K. Energy Efficient Per NEMA TP-1

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:

1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.

2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.

3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Set transformers plumb and level.

I. Use flexible conduit, under the provisions of Section 260534, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

J. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

K. Provide grounding and bonding in accordance with Section 260526.

L. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

M. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

N. Install transformer identification nameplate in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.2.1.1. In addition to the basic requirements of Section 7.2, include the following:

1. Perform turns ratio tests at all tap positions.

2. Verification that as-left tap connections are as specified.

3. Perform excitation-current tests on each phase.

4. Measure the resistance of each winding at each tap connection.

5. Overpotential test on all high- and low-voltage windings-to-ground.

3.4 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262200

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

1. Includes requirements for the seismic qualification of equipment specified in this section.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 262813 - Fuses: Fuses for fusible switches and spare fuse cabinets.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

2. Include documentation of listed series ratings upon request.

3. Identify mounting conditions required for equipment seismic qualification.

D. Manufacturer's equipment seismic qualification certification.

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, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

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 carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com/#sle.

B. Schneider Electric; Square D Products; _____: www.schneider-electric.us/#sle.

C. Substitutions: See Section 016000 - Product Requirements.

D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Seismic Qualification: Provide panelboards and associated components suitable for application under the seismic design criteria specified in Section 260548 where required. Include certification of compliance with submittals.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.

3. Label equipment utilizing series ratings as required by NFPA 70.

E. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

G. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

H. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

K. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

N. Load centers are not acceptable.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

    a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.

    b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

    c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

3. Conductor Terminations:

    a. Provide mechanical lugs unless otherwise indicated.

    b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

    a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

    b. Provide interchangeable trip units where indicated.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

    a. Provide the following field-adjustable trip response settings:

        1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.

        2) Long time delay.

        3) Short time pickup and delay.

        4) Instantaneous pickup.

6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

7. Provide the following circuit breaker types where indicated:

    a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

    b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.

8. Do not use tandem circuit breakers.

9. Do not use handle ties in lieu of multi-pole circuit breakers.

10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

11. Provide the following features and accessories where indicated or where required to complete installation:

a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.4 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Provide required seismic controls in accordance with Section 260548.

G. Install panelboards plumb.

H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

I. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

J. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

K. Provide grounding and bonding in accordance with Section 260526.

L. Install all field-installed branch devices, components, and accessories.

M. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

O. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

P. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

Q. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

R. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.

S. Provide filler plates to cover unused spaces in panelboards.

T. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

1. Fire detection and alarm circuits.

2. Communications equipment circuits.

3. Intrusion detection and access control system circuits.

4. Video surveillance system circuits.

U. Identify panelboards in accordance with Section 260553.

V. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

W. Provide identification nameplate for each panelboard in accordance with Section 260553.

X. Provide arc flash warning labels in accordance with NFPA 70.

Y. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

Z. Ground and bond panelboard enclosure according to Section 260526.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform field inspection and testing in accordance with Section 014000.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 225 amperes. Tests listed as optional are not required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

I. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.2 RELATED REQUIREMENTS

A. Section 260533.16 - Boxes for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

J. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Arrow-Hart, a brand of Cooper Wiring Devices: www.cooperindustries.com

B. Leviton Manufacturing, Inc: www.leviton.com.

C. P & SNone - N/A.

D. Bryant

E. Hubbell

2.2 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

I. For flush floor service fittings, use tile rings for installations in tile floors.

J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.3 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Gray withNone - N/A stainless steel wall plate.

C. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

D. Wiring Devices Connected to Emergency Power: Redwith red metal faceplate.

2.4 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes: As coordinated with architect.

2.5 WALL SWITCHES

A. Wall Switches: Extra Heavy Duty Industrial Series, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.

1. Body and Handle: Gray plastic with toggle handle.

2. Ratings:

a. Voltage: 120 volts, AC.

b. Current: 20 amperes.

B. Switch Types: Single pole, 3-way, and 4-way.

2.6 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated; _____: www.hubbell.com/#sle.

2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.

3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.

4. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

5. Substitutions: See Section 016000 - Product Requirements.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

E. USB Charging Devices:

1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.

a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.

2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

F. Receptacles: Extra Heavy Duty Industrial Series, complying with NEMA WD 6 and WD 1.

1. Device Body: _____ plastic.

2. Configuration: NEMA WD 6, type as specified and indicated.

G. Convenience Receptacles: Type 5-20R.

H. Single Convenience Receptacles.

I. Duplex Convenience Receptacles.

J. GFCI Receptacles: 5-20R Duplex Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.7 WALL PLATES

A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

D. Decorative Cover Plates: , Smooth stainless steel.

E. Surface Mounted Device Wall Plates: Stamped steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated.

C. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: As indicated on the drawings.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

D. Install wiring devices in accordance with manufacturer's instructions.

E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

F. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

J. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

K. Install wiring devices plumb and level with mounting yoke held rigidly in place.

L. Install wall switches with OFF position down.

M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Q. Identify wiring devices in accordance with Section 260553.

R. Connect wiring device grounding terminal to outlet box with bonding jumper.

S. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

T. Connect wiring devices by wrapping conductor around screw terminal.

U. Install galvanized steel cover plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted switches & outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 260537 to obtain mounting heights specified.

B. Install wall switch 48 inches (1.2 m) above finished floor.

C. Install convenience receptacle 18 inches (450 mm) above finished floor.

D. Install convenience receptacle 6 inches (150 mm) above counter.

E. Install telephone jack 18 inches (450 mm) above finished floor.

F. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches (1.4 m) above finished floor.

G. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches (1.2 m) above finished floor.

3.5 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Operate each wall switch with circuit energized and verify proper operation.

E. Test each receptacle to verify operation and proper polarity.

F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Fuse Pullers: One set(s) compatible with each type and size installed.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Power Load Feeder Switches: Class RK1 (time delay).

H. Motor Load Feeder Switches: Class RK1 (time delay).

2.3 CLASS RK1 (TIME DELAY) FUSES

A. Manufacturers:

1. Bussman, Ferraz-Shawmut.

2. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 262813

SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Drivers.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

1.3 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

E. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Conform to requirements of NFPA 70 .

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

C. Provide five year manufacturer warranty minimum for all dimming drivers.

D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 .

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 DRIVERS

A. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Airplane cable: Steel Wire.

C. Fire-Rated Luminaire Enclosures:

1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Provide required seismic controls in accordance with Section 260548.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

I. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

J. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

K. Install accessories furnished with each luminaire.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use conduit type indicated.

M. Connect luminaires to branch circuit outlets provided under Section 260537 using flexible conduit.

N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

O. Bond products and metal accessories to branch circuit equipment grounding conductor.

P. Install specified lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection in accordance with Section 014000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and adjust fixtures as directed.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean finishes and touch up damage.

3.7 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.9 PROTECTION

A. Replace luminaires that have failed lamps or drivers at Substantial Completion.

3.10 SCHEDULE - See Drawings

END OF SECTION 265100

SECTION 265600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

C. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.

2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

I. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 DRIVERS

A. Drivers - General Requirements:

1. Minimum Efficiency/Efficacy: Provide drivers complying with all current applicable federal and state ballast efficiency/efficacy standards.

2. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

2. Material: Steel, unless otherwise indicated.

3. Shape: Square straight, unless otherwise indicated.

4. Finish: Match luminaire finish, unless otherwise indicated.

5. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

G. Pole-Mounted Luminaires:

1. Maintain the following minimum clearances:

a. Comply with IEEE C2.

2. Foundation-Mounted Poles:

a. Install foundations plumb.

b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.

c. Tighten anchor bolt nuts to manufacturer's recommended torque.

d. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.

3. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265600

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Geotechnical Engineering Report ECS Mid-Atlantic, LLC (March 17, 2026), applies to this section.

C. Related sections include the following:
1. PennDOT Publication 408 in its latest revision, Section 204 Class 2, Class 3 and Class 4 Excavation and Section 203 Class 1, Class 1A, Class 1B and Class 1C Excavation. Use PennDOT Publication 408 for any discrepancies between specifications provided in this document and the PennDOT Highway Construction Specifications.

1.2 SUMMARY

A. This Section includes all items of work necessary to complete excavation and grading of the entire site to finished grades. This item includes excavation required for pavement, slabs on grade, structure backfill, subbase, curbs, sidewalk, drainage structures and pipe, utilities, planting soil media filter strip, basins, spillways, BMP's and all other site work. Stripping of topsoil, stockpiling topsoil and other fill materials, storage of excavated materials, respreading of topsoil and/or other fill material is included. This work includes over-excavation for planting soil media installation. Excavation shall include removal, grading and placement of material to meet proposed grades as shown on the plans. Contractor to determine overall cut/fill quantities and confirm if project requires importing or exporting of material. Work includes suitable borrow material if necessary. Material slips for materials brought onto site shall be submitted to Engineer for review and approval. Waste material removal/stockpile locations to an approved site to be determined by Contractor and coordinated with Engineer. All grades, elevations, slopes, and surfaces are the responsibility of the contractor. Excavation includes placement and removal of temporary fill material as indicated on the plans.

1.3 DEFINITIONS

A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials to be removed.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer,

who will make an inspection of conditions. If Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer. The contract sum may be adjusted by an appropriate contract modification.

1. Removal of unsuitable material and its replacement as directed will be paid on basis of unit prices relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

E. Structure: Culverts, buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

F. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

G. Borrow Soil / Material: Satisfactory soil imported from off-site for use as fill or backfill.

H. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

1.4 SUBMITTALS

A. Test Reports: Submit the following reports directly to Engineer from the testing services, with copy to Contractor:

1. Test reports on borrow material.
2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
3. Field reports; in-place soil density tests.
4. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Contractor shall employ and pay for a qualified independent geotechnical testing laboratory to perform soil testing and inspection service during earthwork operations.

C. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory must demonstrate to Engineer's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct required field and laboratory geotechnical testing without delaying the progress of the Work.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are

indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

    a. Provide minimum of 48-hour notice to Engineer, and receive written notice from affected utility to proceed before interrupting any utility.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

B. Use of Explosives: Use of explosives is not permitted.

C. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
3. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP. GEOSCIENCE REVIEW

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Subbase Material: PennDOT No. 2A Coarse Aggregate.

D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

E. Backfill and Fill Materials: As specified in subsurface investigation and foundation report.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

3.2 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

D. The contractor is responsible for the stability and safety of all excavated areas.

3.3 DEWATERING

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.4 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Dispose of excess excavated soil material and materials not acceptable for use as backfill topsoil or fill.

3.5 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete

formwork, installation of services, and other construction and for inspection.

1. Excavations for footings and foundations: See architectural and/or structural plans and specifications.
2. For pile foundations, stop excavations from 6 inches to 12 inches above bottom of footing before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.6 EXCAVATION FOR PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of one foot of clearance on both sides of pipe or conduit.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line or to the depth indicated on the contract drawings.

1. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of crushed stone or gravel prior to installation of pipe.
2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.8 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.9 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grassed areas, use satisfactory excavated or borrow material.
2. Under walks and pavements, use subbase material.
3. Under steps, use subbase material.
4. Under building slabs, use subbase material or structural backfill

5. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
6. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

    a. Concrete is specified in Division 3.
    b. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
7. Backfill trenches with concrete where indicated on the plans.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.10 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

B. Place backfill and fill materials as specified in subsurface investigation and foundation report.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557 or in accordance with

subsurface investigation whichever is more stringent.

a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.
c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.11 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.12 PAVEMENT SUBBASE COURSE

A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

1. Refer to other Division 32 sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12-inch width of shoulder simultaneous with the compaction and rolling of each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

1. When a compacted subbase course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.13 BUILDING SLAB DRAINAGE COURSE

A. See architectural plans and specifications.

3.14 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2167 (rubber balloon method), as applicable.

a. Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.
b. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the

Engineer.

2. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Engineer.
3. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.
4. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.
5. If in opinion of Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.
6. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.15 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction, and as specified in Division 31, Section 312500 - "Soil Erosion and Sediment Control."

3.16 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

END OF SECTION 310000

SECTION 310141 - DUST CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This work shall consist of continuous sweeping of roads to remove dust/dirt, furnishing water or calcium chloride and applying it for the purpose of allaying dust conditions. There will be no separate payment for dust control. This will not be paid for directly, but will be considered incidental to the other work in the Contract

1.3 METHOD OF MEASUREMENT

A. There will be no measurement for Dust Control.

BASIS OF PAYMENT

A. There will be no separate payment for Dust Control. This work will not be paid for directly, but will be considered incidental to the other items of work in the contract.

PART 2 - PRODUCTS

2.1 WATER

A. Water used shall be clean, and shall be obtained from sources approved by the ENGINEER.

2.2 CALCIUM CHLORIDE

A. Calcium chloride pellet form or flake form shall be equally acceptable.

B. The name of manufacturer, name of the product, net weight, and percentage of calcium chloride guaranteed by the manufacturer shall be legibly marked on each contained, except in the case of bulk shipments where the shipping notice will be acceptable as evidence of compliance with these requirements.

C. Calcium chloride may be delivered in moisture proof bags containing not more than 100 pounds each or in air-tight drums weighing not more than 450 pounds each, or it may be delivered in bulk, and shall comply with ASTM Designation D98.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. WATER

1. Water shall be applied at the location, at such times, and in the amount as may be required.

2. Equipment shall consist of tanks, tank trucks, distributors, pumps, hose or other devices, approved by the ENGINEER, which are capable of applying a uniform spread of water over the surface. Suitable shut-off and flow regulations shall be provided.

B. CALCIUM CHLORIDE

1. Calcium chloride shall be applied at the locations, at such times, and in the amount as may be required. It shall be spread such that uniform distribution is attained over the entire area on which it is ordered placed.

END OF SECTION 310141

SECTION 311000 - SITE CLEARING

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. Protection of existing trees indicated to remain.
2. Removal of trees and other vegetation.
3. Clearing and grubbing.
4. Removing above-grade improvements.
5. Removing below-grade improvements.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than **2 inches in** diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PROJECT CONDITIONS

A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing

improvements indicated to remain in place.

1. Protect improvements on adjoining properties and on Owner's property.

2. Restore damaged improvements to their original condition, as acceptable to property owners.

C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing. Install tree protection fence as indicated on contract drawings and in accordance with Section 130010.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.

2. Provide protection for roots over 1-1/2 inch in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Engineer. Employ a licensed arborist to repair damage to trees and shrubs.

4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.

D. Improvements on Adjoining Property: Authority for performing removal and alteration work on property adjoining Owner's property will be obtained by Owner prior to award of contract. These areas are identified as easements or right-of-ways. Any areas above or outside these indicated areas are the responsibility of the contractor.

1. Extent of work on adjacent property is indicated on Drawings.

E. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.

1.5. EXISTING SERVICES

A. General: Indicated locations are approximate; determine exact locations before commencing Work.

B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 310000 "Earthwork."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Planting Soil Media: Requirements for planting soil media are specified in Section 130010 "Special Construction."

PART 3 - EXECUTION

3.1 SITE CLEARING

A. General: Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots at an approved landfill site.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.

a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.

B. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.

2. Use only hand methods for grubbing inside drip line of trees indicated to remain.

3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.

C. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings. Removing abandoned underground piping or conduits interfering with construction are included under this Section.

3.2 DISPOSAL OF WASTE MATERIALS

1. Burning on Owner's Property: Burning is not permitted on Owner's property.

2. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property. Comply with hauling and disposal regulations of authorities having jurisdiction.

3.3 ACCESS AND USE OF SITE

Contractor shall only be permitted access to the site and access on the site by utilizing those areas to be cleared or by those areas which have been cleared and are within the limits of construction as outlined on drawings. All of contractor's operation will be limited to those areas within the limits of construction as detailed on the drawings.

END OF SECTION 311000

SECTION 312316.13 - TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.2 PRICE AND PAYMENT PROCEDURES

A. Excavating Soil Materials:

1. Measurement method: By the cubic foot (cubic meter).

2. Includes: Excavating to required elevations, loading and placing materials in stockpile, and dewatering.

3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

B. General Fill:

1. Measurement Method: By the cubic foot (cubic meter).

2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

C. Granular Fill:

1. Measurement Method: By the cubic foot (cubic meter).

2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

D. Aggregates:

1. Measurement Method: By the cubic foot (cubic meter).

2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.

1.3 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.4 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2018.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012, with Editorial Revision (2015).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012, with Editorial Revision (2015).

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

C. Compaction Density Test Reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill - Fill Type ____: Subsoil excavated on-site.

1. Graded.

2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.

3. Complying with ASTM D2487 Group Symbol CL.

2.2 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.3 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Remove excess excavated material from site.

I. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

J. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.4 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.5 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

F. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:

1. At other locations: 95 percent of maximum dry density.

I. Reshape and re-compact fills subjected to vehicular traffic.

3.6 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, Duct Bank, and _____ and _____:

1. Bedding: Use general fill.

2. Cover with general fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.

3.7 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

3.8 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.9 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 312316.13

SECTION 312500 - SOIL EROSION AND SEDIMENT CONTROL

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.

B. PennDOT Publication 408, Sections 212, 806, 849, 850, 855, 860, 866, and 867 in its latest revision. Use PennDOT Publication 408 for any discrepancies between specifications provided in this document and the PennDOT Highway Construction Specifications.

1.2 DESCRIPTION OF WORK

A. This work shall consist of temporary control measures as ordered by the county Conservation District (hereinafter referred to as Regulatory Agency), during the life of the contract to control water pollution, through the use of berms, dikes, dams, sedimentation, basins, jute matting, soil retention blankets, gravel, mulches, grasses, slope drains, trench plugs and other erosion control devices or methods.

B. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features specified elsewhere in the contract to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

C. Temporary pollution control may include construction work outside the project site where such work is necessary as a result of construction such as borrow pit operations, haul roads and equipment storage sites.

D. Erosion control shall be in accordance with the contract drawings, plan narrative, details and specifications contained herein.

E. Soil samples as necessary must be taken. The analyses from the Penn State University must be provided to the Engineer provided the recommended seeding and soil supplements. A minimum of three (3) samples must be taken.

PART 2 – PRODUCTS

1. Concrete Washout - In accordance with Contract Drawings
2. Pumped Water Filter Bag – In accordance with PennDOT Publication 408, Section 855
3. Inlet Protection – In accordance with PennDOT Publication 408, Section 860
4. Rock Filter – In accordance with PennDOT Publication 408, Section 866
5. Rolled Erosion Control Product – In accordance with Contract Drawings and PennDOT Publication 408, Section 806
6. Planting Soil Media – In accordance with Section 130010 “Special Construction”
7. Compost Filter Sock – In accordance with PennDOT Publication 408, Section 867
8. Seeding - In accordance with PennDOT Publication 408, Section 804, and Contract Drawings.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. General - Temporary pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

B. The Regulatory Agencies have the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface areas of erodible earth materials exposed by excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, and other areas of water impoundment.

C. The following are procedures that the Contractor may have to use to achieve temporary or permanent erosion and water pollution controls:

- Contour ditching during certain phases of the work.
- Construct berms, dikes and slope drains.
- Hay or straw bale barriers, sediment sacks, or silt fence fabric shall be placed at all stormwater inlets to prevent sediment from entering the inlets.
- Other methods as necessary to control erosion.

D. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled and ordered by the ENGINEER, such work shall be performed by the Contractor at his own expense. Temporary erosion and pollution control work required which is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, will be performed as ordered by the Regulatory Agencies, at the Contractor's expense.

E. Pre-construction Conference - During the pre-construction conference or prior to the start of the applicable construction, the Contractor shall submit for acceptance his schedules for accomplishing temporary and permanent erosion control work, as are applicable for and prior to clearing and grubbing, grading, bridges and other structures at watercourses, and paving. He shall also submit for acceptance his plan for disposal of waste materials. No work shall be started until the erosion control schedule and method of operation meet with the Regulatory Agency's approval.

F. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practical time as outlined in his accepted schedule.

G. The Regulatory Agency will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordinate unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justifiable.

H. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit. Otherwise temporary erosion control measures may be required between successive construction stages. Under no

conditions shall the surface areas of erodible earth material exposed at one time by clearing and grubbing exceed 75,000 square feet without approval by the Regulatory Agency.

I. The Regulatory Agency may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions. This analysis shall take into consideration the temporary and/or permanent erosion control measures installed to control water pollution by erosion in the area.

J. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or Local agencies, the more restrictive laws, rules or regulations shall apply. The Contractor's permanent and temporary erosion and sedimentation control practices are subject to the review and approval by the local agency responsible for such review.

K. The erosion control features installed by the Contractor shall be acceptably maintained by the Contractor at all times.

L. The Contractor shall be responsible for providing temporary erosion control measures both during construction and during any shut-down periods. All erosion control measures shall apply to temporarily stockpiled materials that will be used in completing the scope of the project as well as natural and/or existing materials present at the project site prior to the start of construction.

M. The Contractor shall familiarize himself with the requirements of any earth disturbance of erosion and sedimentation control permits and shall adhere to the requirements contained therein for the life of the project.

N. Contractor responsible to obtain all permits required for disposal of any and all soil in the project.

END OF SECTION 310120

SECTION 321216 - ASPHALT PAVING

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. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Asphalt surface treatments.
6. Pavement-marking paint.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
2. Job-Mix Designs: For each job mix proposed for the Work.

B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.5 QUALITY ASSURANCE

A. Comply with PENNDOT Specifications Publication 408 in its latest revision.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the conditions set forth in PENNDOT Publication 408 are not met.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

C. Imprinted Asphalt Paving: Proceed with coating imprinted pavement only when air temperature is at least 50 deg F and rising and will not drop below 50 deg F within 8 hours of coating application. Proceed only if no precipitation is expected within two hours after applying the final layer of coating.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Aggregate for Base Course and Subgrade Drainage. Construction shall conform to PENNDOT Type C or better; No. 2A, Section 703.2 except not more than 8% of base course shall be finer than No. 200 sieve.

2.2 ASPHALT MATERIALS

A. Bituminous surface course and binder course shall comply with PENNDOT Publication 408, Section 413. Bituminous Concrete Base Course shall conform to Section 313.

B. Tack Coat: Shall conform to PENNDOT Publication 408, Section 460.2.

C. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.

C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

D. Joint Sealant: PG 64-22, shall conform to PENNDOT Publication 408, Section 469.

E. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, colors complying with FS TT-P-1952.

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction for paving of new roadways. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 1-1/2 inches unless otherwise indicated on the plans an details.
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Transport milled hot-mix asphalt to asphalt recycling facility.
7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending to depth indicated on the details into adjacent sound pavement. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Proof-roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

C. Notify Engineer of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACING

A. All construction shall conform to Section 413 and 350.3 of the PENNDOT Publication 408 Specifications. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required or approved by the Engineer.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
4. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 ASPHALT CURBS

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F.

1. Asphalt Mix: Same as pavement surface-course mix.

B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch
2. Surface Course: Plus 1/8 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/8 inch.

3.11 PAVEMENT MARKING

A. In accordance with Section 321723 “Pavement Markings.”

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. Replace and compact hot-mix asphalt where core tests were taken.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concrete paving.

1. Driveways.
2. Aprons.
3. Roadways.
4. Parking areas.

B. Related Requirements:

1. Section 033001 "Cast-in-Place Concrete – Site Work" for general building applications of concrete.
2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
3. Contract Drawings.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.7 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with **ACI 301** unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of **100 feet** or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawnsteel wire into flat sheets.

C. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

D. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A, plain steel.

E. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.

F. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A615/A615M, Grade 60 deformed bars.

G. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M; with ASTM A615/A615M, Grade 60 deformed bars.

H. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips.

I. Plain-Steel Wire: ASTM A1064/A1064M, as drawn.

J. Deformed-Steel Wire: ASTM A1064/A1064M.

K. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A; coated, plain.

L. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A767/A767M, Class I coating. Cut bars true to length with ends square and free of burrs.

M. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 plain-steel bars.

N. Tie Bars: ASTM A615/A615M, Grade 60; deformed.

O. Hook Bolts: ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

P. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

Q. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

R. Zinc Repair Material: ASTM A780/A780M.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150/C150M, white portland cement Type I.
2. Fly Ash: ASTM C618, Class C.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4M, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 3/4 to 1 inch nominal.
2. Aggregate Source, Shape, and Color:

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water: Potable and complying with ASTM C94/C94M.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

1. Fly Ash or Pozzolan: 25 percent.
2. Slag Cement: 50 percent.
3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content, 1-1/2-inch Nominal Maximum Aggregate Size: 4-1/2 percent plus or minus 1-1/2 percent.
2. Air Content, 1-inch Nominal Maximum Aggregate Size: 4-1/2 percent plus or minus 1-1/2 percent.
3. Air Content, 3/4-inch Nominal Maximum Aggregate Size: 5 percent plus or minus 1-1/2 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture plasticizing and retarding 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.

F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd..

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

H. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 8 inches, plus or minus 1 inch.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M and ASTM C1116/C1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete

without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963/D3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if

joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes.

   a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

   a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:

1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.

1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread 40 lb/100 sq. ft. of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

D. Rock-Salt Finish: After initial brooming, uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft.

1. Embed rock salt into plastic concrete with roller.
2. Cover paving surface with **1-mil-** thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.

E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer to match paving color required.
2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
3. After final power floating, apply a hand-troweled finish followed by a broom finish.
4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or 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.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M will be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

   a. When frequency of testing will provide fewer than five compressive-strength tests

for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test to be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results to be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.12 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by

removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Cold-applied, fuel-resistant joint sealants.
4. Hot-applied, fuel-resistant joint sealants.
5. Joint-sealant backer materials.
6. Primers.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.2 SUBMITTALS

A. Product Data:

1. Concrete pavement joint sealants.
2. Joint-sealant color.
3. Joint-sealant backer materials.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

1.4 FIELD CONDITIONS

A. 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 or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are

compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.3 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints 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: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of

joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backers to support joint 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 joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements 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 joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. 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 and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 321713 - PARKING BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast concrete wheel stops.

1.2 SUBMITTALS

A. Product Data:

1. Precast concrete wheel stops.

PART 2 - PRODUCTS

A. Precast Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete; 5500-psi minimum compressive strength; 5 inches high by 9 inches wide by 72 inches long with two 1/2 inch rebar inside the entire length. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.

1. Source Limitations: Obtain wheel stops from single source from single manufacturer.
2. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
3. Surface Sealer: Manufacturer's standard salt-resistant, clear sealer applied at precasting location.
4. Mounting Hardware: Steel ½ inch diameter, 36-inch minimum length rebar.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.

B. Install wheel stops in bed of adhesive before anchoring to substrate.

C. Securely anchor wheel stops to substrate with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

SECTION 321723 - PAVEMENT MARKINGS

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. Painted markings applied to asphalt paving.
2. Painted markings applied to concrete surfaces.

B. Related Requirements:
1. Section 033001 “Cast in Place Concrete – Site Work”
2. Section 321313 “Concrete Paving”
3. Section 321216 "Asphalt Paving"

1.3 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.

1. Pavement-marking paint, alkyd.
2. Pavement-marking paint, solvent-borne.
3. Pavement-marking paint, acrylic.
4. Pavement-marking paint, latex.
5. Pavement-marking paint, thermoplastic
6. Glass beads.

B. Shop Drawings:

1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of PennDOT Publication 408 for pavement-marking work.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces per PennDOT Publication 408.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Supplier found within PennDOT Bulletin 15.

B. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design”

2.3 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint per PennDOT Publication 408 and PennDOT Bulletin 15.

B. Glass Beads per PennDOT Publication 408 and PennDOT Bulletin 15.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness per PennDOT Publication 408 standards.

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate meeting PennDOT Publication 408 standards.

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 323113 – CHAIN-LINK FENCES AND GATES

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. Chain-link fence framework.
2. Chain-link fence fabric.
3. Chain-link fittings.
4. Chain-link wires and ties.
5. Chain-link swing gates.
6. Chain-link horizontal-slide gates.
7. Gate operators and controls.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

B. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:

a. Wind Speed: 80 mph.
b. Fence Height: 6 feet.
c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
d. Wind Exposure Category: B.

2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

C. Lightning Protection System: Maximum resistance-to-ground value of 25 ohms at each grounding location along fence under normal dry conditions.

D. Accessibility: Pedestrian gates to comply with the United States Access Board's ADA-ABA Accessibility Guidelines,

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.
4. Gate operators, including operating instructions.
5. Accessories: Barbed wire.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Product Certificates: For each type of chain-link fence, and gate, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

D. Qualification Data: For Installer.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified according to NETA ETT, or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chain-Link Fences and Gates:

a. United States Steel

b. Anchor Fence

c. Or approved equal

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.148 inch.

a. Mesh Size: 2 inches.
b. Weight of Metallic (Zinc) galvanized Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied before weaving.

c. Coat selvage ends of fabric that is metallic coated before the weaving process with Metallic (Zinc) galvanized coating.

2. Selvage: Twisted top and knuckled bottom.

2.3 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, Schedule 40.
2. Fence Height: 6 feet.
3. Strength Requirement: Heavy industrial according to ASTM F 1043.

a. Top Rail: 1.63 inches.
b. Line Post: 2.5 inches.
c. End, Corner and Pull Post: 4.0 inches.
d. Swing Gate Post: 4-inch diameter, 8.65-lb/ft. weight.

4. Coating for Steel Framing:

a. Metallic Coating:

1) Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating per ASTM A 653/A 653M.

2.4 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:

1. Location: Extended along top and bottom of fence fabric.
2. Location: Extended along top of barbed wire arms extended posts and top of fence fabric for supporting barbed tape.

B. Metallic-Coated Steel Wire: 0.148-inch- diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:

1. Metallic Coating: Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
   a. Matching chain-link fabric coating weight.

2.5 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for single and double swing gate types.

1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:

1. Gate Fabric Height: As indicated.
2. Leaf Width: As indicated.
3. Frame Members:

   a. Tubular Steel: 2.0 inches round.

C. Frame Corner Construction:

1. Assembled with corner fittings and 5/16-inch- diameter, adjustable truss rods for panels 5 feet wide or wider.

D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as indicated as required to attach barbed wire assemblies.

E. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and keepers for each gate leaf more than 5 feet wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

2.6 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.

1. Line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Aluminum Alloy 6063.

F. Tension Bars: Aluminum, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
   a. Aluminum: ASTM B 211; Alloy 1350-H19; 0.192-inch- diameter, mill-finished wire.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.

1. Do not begin installation before final grading is completed, unless otherwise permitted by ENGINEER.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

1. Install fencing on established lines inside property line.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly at 10 feet o.c.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at mid-height of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.

1. Top Tension Wire: Install tension wire through post cap loops.
2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Bottom Rails: Install, spanning between posts.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

M. Barbed Wire: Install barbed wire uniformly spaced as indicated on Drawings. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware**,** gate operator and other moving parts.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 323113

SECTION 32 3300 - SITE FURNISHINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tables.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

C. Shop Drawings: Indicate plans for each unit or group of units, elevations with model number, overall dimensions, construction, and anchorage details.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

PART 2 PRODUCTS

2.1 METAL FURNISHINGS

A. Metal Tables and Seating:
1. Picnic Table; EQ-20
    a. Frame: Aluminum.
    b. Slats: Aluminum.
    c. Shape: Rectangle.
    d. Length: 96 inches.
    e. Width: 60 inches.
    f. Height: 30 inches.
    g. Mounting: Freestanding.
    h. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable product by another manufacturer.
        1) RJ Thomas Mfg. Co., Inc; Pilot Rock, XT Series Heavy Duty Portable Rectangular Table with Aluminum Top and Seats System.
2. ADA Accessible Picnic Table; EQ-20A
    a. Frame: Aluminum.
    b. Slats: Aluminum.

c. Shape: Rectangle.
d. Length: 96 inches.
e. Width: 60 inches.
f. Height: 30 inches.
g. Mounting: Freestanding.
h. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable product by another manufacturer.
   1) RJ Thomas Mfg. Co., Inc; Pilot Rock, XT Series Side Access Rectangular Table with Aluminum Top and Seats System.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive site furnishing items.

3.2 INSTALLATION

A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.

B. Provide level mounting surfaces for site furnishing items.

END OF SECTION 32 3300

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. PennDOT Publication 408, Latest Revision.

1.2 SUMMARY

A. Types of work required include following:

1. Fine grading and preparing of lawn areas.

2. Furnishing and applying new topsoil.

3. Furnishing and applying soil amendments.

4. Furnishing and applying fertilizers.

5. Seeding new lawn areas.

6. Reconditioning existing lawn areas.

7. Replanting unsatisfactory or damaged lawns.

8. Soil Conditioning.

9. Maintenance

B. Refer to earthwork sections in this Division for requirements of general excavation, filling, and grading in areas to receive lawns and grasses.

C. Stockpile topsoil for reuse in lawns and grasses. If quantity of stockpiled topsoil is insufficient, provide additional topsoil to complete lawns and grasses.

D. Contractor to provide 4” of compacted topsoil and seeding (unless specifically designated otherwise) on all areas disturbed by construction, with a minimum areas being the limit of disturbance as shown on the drawings.

1.3 SUBMITTALS

A. Certification of Grass Seed: Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

B. Topsoil Analysis Report: Submit soil analysis report for proposed new topsoil.

1. Before delivery of topsoil, furnish ENGINEER a soil analysis made by an acceptable soil testing

laboratory stating percentages of silt, clay, sand, and organic matter, pH, and mineral and plant nutrient content of topsoil. In soil analysis report, indicate suitability of topsoil for lawn growth. If not suitable, state recommended quantities for nitrogen, phosphorus, and potash and any limestone, aluminum sulphate, or other soil amendments to be added to make topsoil suitable.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf and meadow establishment.

1.5 JOB CONDITIONS

A. Planting Time: Sow lawn seed only during normal planting seasons for each type of lawn work required. Correlate planting with specified maintenance periods to provide required maintenance from date of substantial completion.

1.6 SPECIAL PROJECT WARRANTY

A. Warranty lawns and grasses through specified maintenance period and until final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The materials shall conform to the Pennsylvania Department of Transportation Form 408 Specifications, as herein listed. The materials shall be obtained from a dealer or manufacturer whose products are shown by analysis to fulfill the guarantee claimed by the producer.

5.	Soil Supplement Pulverized Agricultural Limestone Fertilizer	Section 804.2(a)
6.	Seeds	Section 804.2(b)
7.	Inoculant	Section 804.2(c)
8.	Herbicides	Section 804.2(d)
9.	Mulch	Section 804.2(a)
6.	Mulch binders	Section 805.2(b)

2.2 SOIL AMENDMENTS

A. Pulverized Agricultural Limestone: Conforming to the requirements of the Agricultural Liming Materials Act of 1978, P.L. 15, No. 9 (3 P.S.132-1), as amended; conforming to the current State Specifications No. L-37 for Group 1, Class B, Type MO; and having an effective neutralizing power of not less than 64. Apply at a rate of 800 pounds per 1,000 S.Y.

2.3 FERTILIZER

A. Commercial Fertilizer: Conforming to the requirements of the Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86 (3P.S.68.2), as amended.

Use dry formulations of 10-20-20 analysis for seeded and sodded areas. Use dry formulations of 20-10-5 and 16-8-16 analysis controlled release for tree, shrub, and vine type planting operations. Use dry formulations of 19-6-12 analysis controlled release for herbaceous wetland planting operations. Use other analysis as indicated or specified in the proposal.

Apply soil supplements as follows, unless otherwise indicated:

- Pulverized Agricultural Limestone-800 pounds per 1,000 S.Y.
- 10-20-20 Analysis Commercial Fertilizer-140 pounds per 1,000 S.Y.
- 38-0-0 Urea Fertilizer - 50 pounds per 1,000 S.Y.

OR

- 32-0-0 to 38-0-0 Sulfur Coated Urea Fertilizer - 59 to 50 pounds per 1,000 S.Y. as directed

OR

- 31-0-0 IBDU Fertilizer - 61 pounds per 1,000 S.Y.

2.4 GRASS MATERIALS

A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed as specified.

SCHEDULE OF GRASS SEED REQUIREMENTS

Seed: In accordance with PennDOT Pub 408 latest revision and Contract Drawings.

B. Erosion Control Mat: North American Green products or equivalent, in accordance with Contract Drawings.

2.5 PRODUCTS

A. Provide topsoil that is fertile, friable, naturally loamy, surface soil; reasonably free of subsoil, clay lumps, brush, weeds and other litter; and free of roots, stumps, stones larger than 2" in any dimension and other extraneous or toxic matter harmful to plant growth.

B. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at site of work. Obtain topsoil from naturally well-drained sties where topsoil occurs at least 4" deep; do not obtain from bogs or marshes.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. Limit preparation to areas that will be planted in immediate future.

B. Loosen subgrade to a minimum depth of 4 inches. Remove stones bigger than 1" in any dimension and sticks, roots, rubbish and other extraneous matter.

C. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to toxic to plant growth.

D. Mix soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of topsoil mixture within a few days. Either mix soil before spreading or apply

soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches of topsoil before planting.

1. Mix lime with dry soil before mixing in fertilizer.

E. Spread topsoil mixture to depth required to meet thickness(but not less than 4" compacted thickness), grades and elevations shown, after light rolling and natural settlement. Do not spread if material or subgrade is frozen.

1. Place approximately ½ of total amount of topsoil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of topsoil mixture.

F. Preparation of Unchanged Grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn and grass planting as follows: Till to a depth of at least 6 inches. Apply soil amendments and initial fertilizers as specified and mix thoroughly into top 4 inches of soil. Remove high areas and fill in depressions; till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots, and other extraneous matter.

1. Before preparing of unchanged areas, remove existing grass, vegetation, and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for lawns.

G. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted within immediate future. Remove trash, debris, stones larger than 1/2 inch diameter, and other objects that may interfere with planting or maintenance operations.

H. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry off before planting lawns. Do not create muddy soil.

I. Restore prepared areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

3.2 SEEDING NEW LAWNS

A. Sow seed with a spreader or a seeding machine. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
2. Sow no less than the quantity of seed specified.

B. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

C. Protect seeded slopes against erosion with jute mesh erosion netting or other similar coverings acceptable to ENGINEER (See Part 2).

3.3 HYDRO-SEEDING NEW LAWNS

A. Mix specified seed, fertilizer, and pulverized mulch in water, using equipment specifically designed for hydro-seed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

B. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate.

3.4 RECONDITIONING LAWNS

A. Recondition existing lawn areas damaged by Contractor's operations including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor re-grading is required.

B. Provide fertilizer, seed or sod, and soil amendments as specified for new lawns and as required to provide satisfactorily reconditioned lawn. Provide new planting soil as required to fill low spots and meet new finish grades.

C. Cultivate bare and compacted areas thoroughly to provide a good, deep planting bed.

D. Remove diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel, and other construction materials; replace with new topsoil.

E. Where substantial lawn remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding. If weeds are extensive, apply selective chemical weed killers as required. Apply seedbed mulch, if required, to maintain moist condition.

F. Water newly planted areas and keep moist until new grass is established.

3.5 PROTECTION

A. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

3.6 MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue for the periods required to establish acceptable lawns, but no less than the following:

1. Seeded lawns at least 60 days after date of substantial completion.

    a. If seeded in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance during following spring until acceptable lawn is established.

B. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading, replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

C. Re-mulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

D. Replant bare areas with same materials specified for lawns.

E. Watering: Provide and maintain temporary piping, hoses and lawn watering equipment to convey water from sources and to keep lawn areas uniformly moist as required for proper growth.

F. Lay out temporary lawn-watering system and arrange watering schedule to prevent puddling, water erosion, and displacement of seed or mulch (if any). Lay out temporary watering system to avoid

necessity of walking over muddy or newly seeded areas.

G. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height. Remove no more than 40 percent of grass leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Time initial and subsequent mowings to maintain following grass height:

1. Mow grass from 1½" to 2" high. Do not mow to less than 1½".

H. Apply second fertilizer application after first mowing and when grass is dry.

1. Use fertilizer that will provide at least 1.0 lb. of actual nitrogen per 1,000 sq. ft. of lawn area.

3.7 ACCEPTANCE

A. When work is substantially completed, and maintenance period is complete, ENGINEER will, upon request, make an inspection to determine acceptability.

1. Lawn work may be inspected for acceptance in parts agreeable to ENGINEER, provided work offered for inspection is complete, including maintenance.

B. Replant rejected work and continue specified maintenance until re-inspected by ENGINEER and found to be acceptable.

C. Seeded lawns will be acceptable provided requirements, including maintenance, have been met and healthy, uniform close stand of specified grass is established free of weeds, bare spots, and surface irregularities.

3.8 CLEANUP

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

3.9 NEW TOPSOIL

A. Provide topsoil that is fertile, friable, naturally loamy, surface soil; reasonably free of subsoil, clay lumps, brush, weeds, and other litter; and free of roots, stumps, stones larger than 2" in any dimension, and other extraneous or toxic matter harmful to plant growth.

B. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at site of work. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4" deep; do not obtain from bogs or marshes.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plant materials.
2. Fertilizers.
3. Weed-control barriers.
4. Mulches.
5. Herbicides and pesticides.
6. Tree-stabilization materials.

B. Related Requirements:

1. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.2 ALLOWANCES

A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Plant materials.
2. Fertilizers.
3. Weed-control barriers.

4. Mulches.
5. Herbicides and pesticides.
6. Tree-stabilization materials.
7. Landscape edgings.
8. Tree grates.
9. Tree-watering devices.

B. Product Data Submittals: For each product.

1. Plant Materials: Include quantities, sizes, quality, and verified sources for plant materials.

1.6 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: Percolation tests for tree pits. Include the following:

1. Tree identification number matching the plans.
2. Date of test.
3. Time when water was added to tree pit to start percolation test.
4. Time with photo documentation showing increments of testing with water level in tree pit.
5. Identification of tester.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.

C. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Experience: Three years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
3. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure in accordance with ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, or walkways and pavements; or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

I. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 15 through May 15.
2. Fall Planting: September 15 through November 15.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
b. Structural failures, including plantings falling or blowing over.
c. Faulty performance of tree stabilization edgings and tree grates.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of Substantial Completion.

a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
c. Annuals: Three months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; with tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); with crossing trunks; with cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare in accordance with ANSI Z60.1.

D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to ensure symmetry in planting.

F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but are not yet in bloom.

2.2 FERTILIZERS

A. Granular Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. 0.75 lb/1000 sq. ft. 3 percent of actual nitrogen, 4 percent phosphorous, and 3 percent potassium, by weight.
b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and maximum of 5.5 percent inert material.

2.3 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers inert to biological degradation and naturally resistant to chemicals, alkalis, and acids, formed into a stable network so that fibers retain their relative position.

B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd..

2.4 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood
2. Size Range: 3 inches maximum.
3. Color: Owner selection.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8;

moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.5 HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

C. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended in writing by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.6 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or compression springs.
4. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated compression springs, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.

C. Palm Bracing: Battens or blocks, struts, straps, and protective padding.

1. Battens or Blocks and Struts: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-4-inch nominal by lengths indicated.

2. Straps: Adjustable steel or plastic package banding.
3. Padding: Burlap.

2.7 TREE-WATERING DEVICES

A. Watering Pipe: PVC pipe 4 inches in diameter, site-cut to length as required, and with snug-fitting removable cap.

2.8 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix in accordance with manufacturer's written instructions.

B. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D448 for Size No. 8.

C. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until moisture content reaches acceptable levels to attain required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil in accordance with manufacturer specifications and Contract Drawings.

B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to depth of 10 ft., whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, remove soil in a level manner from root ball to where the top-most root emerges from the trunk. After soil removal to expose root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.

    a. Quantity: As indicated on Drawings.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch above adjacent finish grade.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. Spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working.
3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole or touching the roots.
6. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of root ball.

3.6 MECHANIZED TREE-SPADE PLANTING

A. Plant trees with approved mechanized tree spade at designated locations. Do not use tree spade to move trees larger than maximum size allowed for similar field-grown, balled-and-burlapped, root-ball diameter in accordance with ANSI Z60.1, or trees larger than manufacturer's maximum size recommendation for tree spade being used, whichever is smaller.

B. Use same tree spade to excavate the planting hole as will be used to extract and transport the tree.

C. When extracting tree, center the trunk within the tree spade and move tree with solid ball of earth.

D. Cut exposed roots cleanly during transplanting operations.

E. Plant trees following procedures in "Tree, Shrub, and Vine Planting" Article.

F. Where possible, orient the tree in same direction as in its original location.

3.7 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and vines in accordance with standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.8 INSTALLATION OF TREE-STABILIZATION MATERIALS

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying:

a. Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
b. Stake trees with two stakes for trees up to 12 ft. high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 ft. high and up to 4 inches in caliper. Space stakes equally around trees.

2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
3. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 ft. in height and more than 3 inches in caliper unless otherwise indicated.

1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.

a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide compression spring for each guy wire and tighten securely.
b. For trees more than 6 inches in caliper, anchor guys to wood deadmen buried at least 36 inches below grade. Provide compression spring for each guy wire and tighten securely.
c. Support trees with bands of flexible ties at contact points with tree trunk and reaching to compression spring. Allow enough slack to avoid rigid restraint of tree.

d. Support trees with guy cable or straps, connected to brass grommets of tree-tie webbing at contact points with tree trunk and reaching to compression spring. Allow enough slack to avoid rigid restraint of tree.
e. Attach flags to each guy wire, 30 inches above finish grade.
f. Paint compression springs with luminescent white paint.

2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and in accordance with manufacturer's written instructions.

C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by root ball unless otherwise indicated.

1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of vertical stakes.

a. Install stakes of length required to penetrate at least to dimension indicated on Drawings below bottom of backfilled excavation. Saw stakes off at horizontal stake.
b. Install screws through horizontal hold-down and penetrating at least 1 inch into stakes. Predrill holes if necessary to prevent splitting wood.
c. Install second set of stakes on other side of root trunk for larger trees.

2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and in accordance with manufacturer's written instructions.

D. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.

1. Site-Fabricated Palm-Bracing Method:

a. Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contact trunk.
b. Place diagonal braces and cut to length. Secure upper ends of diagonal braces with galvanized nails into battens or into nail-attached blocks on battens. Do not drive nails, screws, or other securing devices into palm trunk; do not penetrate palm trunk in any fashion. Secure lower ends of diagonal braces with stakes driven into ground to prevent outward slippage of braces.

2. Proprietary Palm-Bracing Device: Install palm-bracing system sized and positioned as recommended by manufacturer unless otherwise indicated and in accordance with manufacturer's written instructions.

3.9 INSTALLATION OF ROOT BARRIER

A. Install root barrier where trees are planted within 48 inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.

B. Align root barrier with bottom edge angled at 20 degrees away from the paving or other hardscape element, and run it linearly along and adjacent to paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for distance of 60 inches in each direction from tree trunk, for total distance of 10 feet per tree. If trees are spaced closer, use single continuous piece of root barrier.

1. Position top of root barrier 1/2 inch above finish grade.
2. Overlap root barrier minimum of 12 inches at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.10 PLACING SOIL IN PLANTERS

A. Place a layer of drainage gravel at least 4 inches thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 4 inches up on all sides. Duct tape along the entire top edge of filter fabric, to secure filter fabric against the sides during soil-filling process.

B. Fill planter with planting soil. Place soil in lightly compacted layers to elevation of 1-1/2 inches below top of planter, allowing natural settlement.

3.11 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.12 INSTALLATION OF MULCHES

A. Install weed-control barriers before mulching in accordance with manufacturer's written instructions. Completely cover area to be mulched, overlapping edges minimum of 12 inches, and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 12-inch radius around trunks or stems. Do not create a mulch cone or place mulch within 4 inches of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 4 inches of trunks or stems.
3. Mineral Mulch in Planting Areas: 3-inches average thickness of mineral mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 4 inches of trunks or stems.

3.13 APPLICATION OF HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written instructions. Do not apply to seeded areas.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written instructions.

C. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and in accordance with manufacturer's written instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.14 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.15 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Perform tree pit percolation tests.
2. Tree pit construction will be considered defective if it does not pass percolation tests and inspections.
3. Do not proceed with planting in tree pits until satisfactory percolation is demonstrated.

C. Prepare test and inspection reports.

3.16 REPAIR AND REPLACEMENT

A. Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in unhealthy condition before end of corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 4 inches or smaller in caliper size.
2. Provide one new tree(s) of 4-inch caliper size for each tree being replaced that measures more than 4 inches in caliper size.
3. Species of Replacement Trees: Same species being replaced.

3.17 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

END OF SECTION 329300

SECTION 330110.58 – DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Disinfection chemicals.

B. Related Requirements:

1. Section 331416 "Site Water Utility Distribution Piping" for product and execution requirements for installation and testing of site domestic water distribution piping.

1.2 UNIT PRICES

A. Disinfection:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Includes preparing, disinfecting, testing, and reporting.

1.3 SUBMITTALS

A. Disinfection Procedure:

1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.

B. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.

C. Certify that final water complies with disinfectant quality standards of authority having jurisdiction.

D. Material Test Reports: For each disinfectant, by a qualified testing agency.

E. Field Quality-Control Reports: For disinfection chemicals.

F. Qualifications Statements: For manufacturer and applicator.

1.4 CLOSEOUT SUBMITTALS

A. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and completion.
3. Test locations.
4. Name of person collecting samples.

5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Applicators Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The PennDOT and PADEP standards.
2. Municipal Authority servicing site location in Plymouth Township.

2.2 DISINFECTION CHEMICALS

A. Chemicals:

1. Hypochlorite: Comply with AWWA B300.
2. Ammonium Sulfate: Comply with AWWA B302.
3. Sodium Chlorite: Comply with AWWA B303.

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. Verify that piping system has been cleaned, inspected, and pressure tested.

C. Verify that access fittings have been installed under Section 331416 "Site Water Utility Distribution Piping."

D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DISINFECTION CHEMICALS

A. Provide required equipment to perform Work of this Section.

B. Introduce treatment into piping system.

C. Maintain disinfectant in system for 24 hours.

D. Flush, circulate, and clean until required disinfectant quality standard has been achieved using municipal domestic water.

E. Replace permanent system devices that were removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Disinfection, Flushing, and Sampling:

1. Disinfect pipeline installation according to AWWA C651.
2. Use of liquid chlorine is not permitted.
3. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
4. Disposal:

    a. Legally dispose of chlorinated water.
    b. If chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.

5. After final flushing and before pipeline is connected to existing system or placed in service, certify that disinfectant level meets quality standards of authority having jurisdiction.

C. Prepare test and inspection reports.

END OF SECTION 330110.58

SECTION 330505.31 - HYDROSTATIC TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hydrostatic testing.

B. Related Requirements:

1. Section 331416 "Site Water Utility Distribution Piping" for pipe materials and accessories normally encountered with pressurized water distribution systems.

1.2 SUBMITTALS

A. Submit following items prior to start of testing:

1. Testing procedures.
2. List of test equipment.
3. Testing sequence schedule.
4. Provisions for disposal of flushing and test water.
5. Certification of test gage calibration.

B. Product Test Reports: For piping, for tests performed by qualified testing agency.

C. Qualifications Statement: For applicator.

1.3 QUALITY ASSURANCE

A. Applicators Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:
1. The Pennsylvania Department of Environmental Protection standards.
2. Pennsylvania Department of Transportation standards.
3. AWWA Standards.

2.2 HYDROSTATIC TESTING

A. Equipment:

1. Pressure pump.
2. Pressure hose.
3. Water meter.
4. Test connections.
5. Pressure relief valve.
6. Pressure Gage: Calibrated to 0.1 psi.

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. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

D. Verify that pressure piping thrust restraints have been installed.

E. Proceed with testing only after unsatisfactory conditions have been corrected.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing of Pressure Piping:

1. Test system according to AWWA C600 and following:

    a. Hydrostatically test each portion of pressure piping, including valved section, at 1.5 times working pressure of piping, based on elevation of lowest point in piping corrected to elevation of test gage or pressure of 150 psi whichever is greater.
    b. Conduct hydrostatic testing for at least two hours.
    c. Slowly fill with water portion of piping to be tested, expelling air from piping at high points.
    d. Install corporation cocks at high points.
    e. Close air vents and corporation cocks after air is expelled.
    f. Raise pressure to specified test pressure.
    g. Observe joints, fittings, and valves undergoing testing.
    h. Remove and renew cracked pipes, joints, fittings, and valves that show visible leakage.
    i. Retest .
    j. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
    k. Maintain pressure within plus or minus 5.0 psi of test pressure.
    l. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of testing.

m. Compute maximum allowable leakage using following formula:

1) L = SD x sqrt(P) /C.
2) L = testing allowance, gph.
3) S = length of pipe tested, feet.
4) D = nominal diameter of pipe, inches.
5) P = average test pressure during hydrostatic testing, psig.
6) C = 148,000.
7) If pipe undergoing testing contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each pipe size.

2. If testing of piping indicates leakage greater than that allowed, locate source of leakage, make corrections, and retest until leakage is within acceptable limits.
3. Correct visible leaks regardless of quantity of leakage.

C. Prepare test and inspection reports.

END OF SECTION 330505.31

SECTION 330561 - CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete and masonry manholes.
2. Frames and covers.
3. Riser rings.
4. Pile support systems.

B. Related Requirements:

1. Section 033001 "Cast-in-Place Concrete – Site Work" for concrete type for manhole and structure foundation slab construction.

1.2 DEFINITIONS

A. Bedding: A type of specialized material placed under manhole prior to installation and subsequent backfill operations.

1.3 UNIT PRICES

A. Manholes:

1. Basis of Measurement: By each manhole.
2. Basis of Payment: Includes excavating, concrete foundation slab, concrete structure sections, cover frame and cover, to indicated depth, and forming and sealing of pipe inlets and outlets.

1.4 SUBMITTALS

A. Product Data:

1. Concrete and masonry manholes.
2. Frames and covers.
3. Riser rings.

B. Shop Drawings:

1. Indicate structure locations and elevations.
2. Indicate sizes and elevations of piping and penetrations.
3. Signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Source Quality-Control Reports: For manholes and covers.

B. Field Quality-Control Reports: For manholes and covers.

C. Qualifications Statement: For manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Handling: Comply with precast concrete manufacturer instructions and ASTM C913 for unloading and moving precast manholes and drainage structures.

C. Storage:

1. Store materials according to manufacturer instructions.
2. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
3. Repair property damaged from materials storage.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry Work.

B. Cold Weather Requirements: Comply with ACI 530/530.1.

1.10 WARRANTY

A. Furnish five -year manufacturer's warranty for concrete manholes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The PennDOT standards.

2.2 PILE SUPPORT SYSTEMS

A. Concrete Cradle:

1. As specified in Section 033001 "Cast-in-Place Concrete – Site Work."
2. Description:

a. Type: Reinforced, as specified in Section 033001 "Cast-in-Place Concrete – Site Work."
b. Strength: 4,000 psi at 28 days.
c. Finish: Rough troweled.

2.3 MATERIALS

A. Cover and Bedding:

1. Bedding: Fill Type per Contract Drawings.
2. Cover: Fill Type per Contract Drawings.

2.4 ACCESSORIES

A. Steps:

1. As required by Contract Drawings.
2. Rungs: Formed Polyproplyne.
3. Fabrication: Formed integral with manhole sections.
4. Diameter: 3/4 inch minimum.
5. Width:

a. As indicated on Drawings.

6. Spacing:

a. 12 inches o.c. vertically, set into structure wall.

b. As indicated on Drawings.

B. Strap Anchors:

1. Shape: Bent steel.
2. Finish: Unfinished.

C. Joint Sealant: Comply with ASTM C990.

D. Fasteners: Stainless steel; ASTM F593.

E. Geotextile Filter Fabric:

1. Per PennDOT Pub 408 Section 735, current edition.
2. Non-biodegradable; nonwoven.
3. Comply with AASHTO M288.
4. Class: A.

F. Concrete: As specified in Section 033001 "Cast-in-Place Concrete - Site Work".

G. Grout: As specified in Section 033001 "Cast-in-Place Concrete - Site Work".

H. Soil Backfill from Above Pipe to Finish Grade:

1. Soil Type as specified in Section 310000 "Earthwork".
2. Subsoil: No frozen earth, or foreign matter, or rocks more than 6 inches in diameter.

2.5 FINISHES

A. Steel Galvanizing:

1. Hot-dip galvanize after fabrication.
2. Comply with ASTM A123/A123M.

2.6 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly.

B. Owner Witnessing:

1. Allow witnessing of factory inspections and tests at manufacturer's test facility.
2. Notify Owner at least seven days before inspections and tests are scheduled.

C. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

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. Examine ground areas for suitable conditions where concrete manholes will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

B. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.

C. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.

D. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION OF CONCRETE AND MASONRY MANHOLES

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.

B. Correct over-excavation with fine aggregate.

C. Remove large stones or other hard matter impeding consistent backfilling or compaction.

D. Protect manhole from damage or displacement while backfilling operation is in progress.

E. Excavating:

1. As specified in Section 312316.13 "Trench Excavation - Unclassified" and in indicated locations and depths.
2. Provide clearance around sidewalls of manhole or structure for construction operations granular backfill.
3. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
4. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Architect/Engineer.

F. Base and Alignment:

1. Place foundation slab and trowel top surface level.
2. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour as indicated on Drawings.
3. Place manhole sections plumb and level, trim to correct elevations, and anchor to foundation slab.
4. Install manholes supported at proper grade and alignment on compacted crushed-stone bedding as indicated on Drawings.
5. Form and place manhole or structure cylinders plumb and level, to correct dimensions and elevations.

G. Attachments:

1. As Work progresses, build fabricated metal items.
2. Cut and fit for pipe.
3. Set cover frames and covers level to correct elevations without tipping.

H. Backfilling: As specified in Section 310000 "Earthwork."

I. Precast Concrete Manholes:

1. Lift precast components at lifting points designated by manufacturer.
2. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
3. Assembly:

    a. Assemble multisection manholes and structures by lowering each section into excavation.
    b. Install rubber gasket joints between precast sections according to manufacturer recommendations.
    c. Lower, set level, and firmly position base section before placing additional sections.

4. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
5. Maintain alignment between sections by using guide devices affixed to lower section.
6. Joint sealing materials may be installed on Site or at manufacturer's plant.
7. Verify that installed manholes meet required alignment and grade.
8. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
9. Cut pipe flush with interior of structure.
10. Shape inverts through manhole as indicated on Drawings.

J. Doghouse Manholes and Structures:

1. Stake out location and burial depth of existing sewer line in area of proposed manhole or structure.
2. Carefully excavate around existing sewer line to adequate depth for foundation slab installation.
3. Protect existing pipe from damage.

4. Cut out soft spots and replace with granular fill compacted to 95 percent maximum density.
5. Bear firmly and fully on compacted crushed stone bedding as indicated on Drawings.
6. Install precast concrete manhole or structure around existing pipe according to applicable Paragraphs in this Section.
7. Grout pipe entrances as specified in Section 033001 "Cast-in-Place Concrete - Site Work".
8. Block upstream flow at existing manhole or structure with expandable plug.
9. Use hydraulic saw to cut existing pipe at manhole or structure entrance and exit and along pipe length at a point halfway up OD on each side of pipe.
10. Bottom half of pipe is to remain as manhole flow channel.
11. Saw cut to smooth finish with top half of pipe flush with interior of manhole or structure.
12. Grout base of manhole or structure to achieve slope to manhole or structure channel as specified in Section 033000.01 "Cast-in-Place Concrete for Site Work" and trowel smooth.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Cast-in-Place Concrete: As specified in Section 033001 "Cast-in-Place Concrete - Site Work".
2. Concrete manholes will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Vertical Adjustment of Existing Manholes and Structures:

1. If required, adjust top elevation of existing manholes and structures to finished grades as indicated on Drawings.
2. Frames, Grates, and Covers:

    a. Remove frames, grates, and covers cleaned of mortar fragments.
    b. Reset to required elevation according to requirements specified for installation of castings.

END OF SECTION 330561

SECTION 331416 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping.
2. Tapping sleeves and valves.
3. Valves and hydrants.
4. Reduced-pressure backflow preventers.
5. Pile support systems.
6. Concrete encasement and cradles.

B. Related Requirements:

1. Section 033001 "Cast-in-Place Concrete – Site Work" for concrete for cradles and encasements.
2. Section 312316.13 "Trench Excavation - Unclassified" for execution requirements for trenching.

1.2 UNIT PRICES

A. Piping:

1. Basis of Measurement: By linear foot.
2. Basis of Payment: Includes hand-trimming excavation, pipe and fittings, bedding, backfilling, connection and tap to building service piping.

B. Valves:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes valve, fittings, and accessories.

C. Backflow Preventers:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes backflow preventer, fittings, and accessories.

D. Taps:

1. Basis of Measurement: By each.
2. Basis of Payment: Includes tapping sleeve, tapping valves, and accessories.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Piping.
2. Tapping sleeves and valves.
3. Valves and hydrants.
4. Reduced-pressure backflow preventers.
5. Pile support systems.
6. Concrete encasement and cradles.

1.4 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: For piping and related equipment.

B. Qualifications Statements: For manufacturer and installer.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

B. Installer Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience in installation of Work of this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Storage:

1. Store materials according to manufacturer instructions.
2. Block individual and stockpiled pipe lengths to prevent moving.
3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
4. Store PE and PVC materials out of sunlight.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 WARRANTY

A. Furnish five-year manufacturer's warranty for valves.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The PennDOT and PADEP standards.
2. Plymouth Township and governing Authority standards.

2.2 PIPING

A. Ductile Iron Pipe:

1. Comply with AWWA C151.
2. Fittings:

a. Material: Ductile iron.
b. Thickness: Standard.

3. Joints:

a. Comply with AWWA C111.
b. Provide rubber gasket with rods.

4. Jackets:

a. AWWA C105 PE jacket.
b. Double-layer, half-lapped, **10-mil PE tape**.

B. Copper Tubing:

1. Comply with ASTM B88.
2. Type: K annealed.
3. Fittings: Cast copper; ASME B16.18.
4. Joints: Compression connection.

C. PVC Pipe:

1. ASTM D1785, Schedule 40.

2. ASTM D1785, Schedule 80.
3. ASTM D2241.
4. SDR26 for 160-psig rating.
5. Fittings: PVC, ASTM D2466.
6. Joints:

    a. Comply with ASTM D2855.
    b. Type: Solvent weld.

D. PVC Pipe with Cast Iron Fittings:

1. Comply with AWWA C900, Class 165.
2. Cast Iron Fittings: Comply with AWWA C111.
3. Joints:

    a. Comply with ASTM D3139.
    b. Furnish compression gasket ring.

E. Steel Pipe:

1. Comply with AWWA C200.
2. Type: Fabricated pipe.
3. Minimum Wall Thickness:

    a. Pipe Diameters 8 Inches (200 mm) and Smaller: 0.375 inches.
    b. Pipe Diameters Greater than 8 Inches (200 mm): 0.50 inches.

4. Fittings and Special Sections: Comply with AWWA C208.
5. Flanges:

    a. Comply with AWWA C207, Class D.
    b. Type: Slip-on.

6. Field Welding Materials: Comply with AWWA C206.
7. Interior Cement Mortar Lining: Comply with AWWA C205.
8. Buried Steel Pipe Exterior Lining:

    a. Fusion-bonded epoxy coating.
    b. Comply with AWWA C203.

F. PE Pipe:

1. AWWA C901.
2. AWWA C906.
3. ASTM D3035, DR9 for 200-psig pressure rating.
4. Fittings:

    a. Comply with AWWA C901.
    b. Type: fabricated.

5. Joints: Compression.

2.3 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:

1. Manufacturers:

   a. JCM Industries, Inc
   b. Kennedy Valve Company; a division of McWane, Inc
   c. Mueller Co. LLC; Mueller Water Products, Inc.
   d. Smith-Blair, a Xylem brand.
   e. U.S. Pipe

2. Material: Ductile or cast iron.
3. Type: Dual compression.
4. Outlet Flange Dimensions and Drilling: Comply with ASME B16.1, Class 125, and MSS SP-60.

B. Tapping Valves:

1. Manufacturers:

   a. Mueller Co. LLC; Mueller Water Products, Inc.
   b. U.S. Pipe

2. Comply with AWWA C500.
3. Type: Double disc with non-rising stem.
4. Inlet Flanges: Comply with ASME B16.1, Class 125, and MSS SP-60.
5. Mechanical Joint Outlets: Comply with AWWA C111.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure Backflow Preventers:

1. Manufacturers:

   a. FEBCO; A WATTS Brand
   b. Flomatic Corporation
   c. Matco-Norc
   d. NIBCO INC.
   e. WATTS; A Watts Water Technologies Company
   f. Zurn Industries, LLC

2. Comply with ASSE 1013.
3. Materials:

   a. Body: Bronze.
   b. Internal Parts: Bronze.
   c. Springs: Stainless steel.

4. Furnish two gate valves, one strainer, and four test cocks.

5. Check Valves:

    a. Quantity: Two.
    b. Independently operating, spring loaded.
    c. Type: Diaphragm type, differential pressure relief, located between check valves.
    d. Provide third check valve opening under back pressure in case of diaphragm failure.
    e. Vent Outlet: Non-threaded.

6. Double Check Valve Assemblies:

    a. Comply with ASSE 1012.
    b. Two independently operating check valves, with intermediate atmospheric vent.
    c. Materials:

        1) Body: Bronze.
        2) Internal Parts: Corrosion resistant.
        3) Springs: Stainless steel.

2.5 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:

1. As specified in Section 033001 "Cast-in-Place Concrete – Site Work."
2. Type: Reinforced, air entrained.
3. Compressive Strength: 4,000 psi at 28 days.
4. Finish: Rough troweled.

B. Concrete Reinforcement: As specified in Section 033001 "Cast-in-Place Concrete – Site Work."

2.6 MATERIALS

A. Bedding and Cover:

1. Bedding: Fill Type as specified in Drawings.
2. Cover: Fill Type as specified in Drawings.
3. Soil Backfill from Above Pipe to Finish Grade:

    a. Soil Type as specified in Drawings.
    b. Subsoil with no rocks greater than 6 inches in diameter, frozen earth, or foreign matter.

2.7 ACCESSORIES

A. Pipe Markers: Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches (150 mm) wide by 4 mils (1 mm) thick, solid blue in color with continuously printed caption in black letters "CAUTION WATER LINE BURIED BELOW."
    a. Install continuous plastic underground warning tape during back filling of trench

for underground water service piping.

B. Steel Rods, Bolt, Lugs, and Brackets:

1. Comply with ASTM A36/A36M or A307.
2. Grade A carbon steel.

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. Examine roughing-in for site water utility distribution piping to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

D. Protect and support existing distribution piping and appurtenances as Work progresses.

3.3 INSTALLATION OF PIPING

A. Bedding:

1. Excavate pipe trench as specified in Section 312316.13 "Trench Excavation - Unclassified".
2. Placement:

    a. Place bedding material as indicated on Drawings.
    b. Service lines shall be placed in soil bedding free of rocks 1-inch or larger in size.
    c. Level fill materials in one continuous layer not exceeding 6 inches of compacted depth.
    d. Compact to 95 percent maximum density.

3. Backfill around sides and to top of pipe with cover fill, tamp in place, and compact to 95 percent maximum density.
4. Backfill around sides and to top of pipe as specified in Drawings.
5. Maintain optimum moisture content of fill material to attain required compaction density.

6. Place fill materials as specified in Drawings.

B. Pipe and Fittings:

1. No water service lines shall be laid in the same trench with gas pipe, sewer pipe, or any other utility. Service line shall be horizontally separated at least 3 feet from a storm sewer pipe, 10 feet from a sanitary sewer line; 10 feet from a septic tank, distribution box, disposal field or seepage pit; and 25 feet from a cesspool by undistributed or compacted earth. Provide minimum of 1.5 feet vertical separation from any utility at crossings.
2. Sharp bends (greater than 15°) in any direction are not allowed unless approved by the Authority.
3. Group piping with other Site piping Work whenever practical.
4. Install pipe to allow for expansion and contraction without stressing pipe or joints.
5. Install access fittings to permit disinfection of water system.
6. Establish elevations of buried piping with not less than 4 feet of cover below the surface of the ground.
7. Pipe Markers: Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches (150 mm) wide by 4 mils (1 mm) thick, solid blue in color with continuously printed caption in black letters "CAUTION WATER LINE BURIED BELOW."
    a. Install continuous plastic underground warning tape during back filling of trench for underground water service piping.
8. Backfill trench as specified in Drawings.

C. Disinfection: As specified in Section 330110.58 "Disinfection of Water Utility Piping Systems."

3.4 TOLERANCES

A. Install pipe within tolerance of 5/8 inch.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Pressure test piping system according to AWWA C600.
2. Pressure test piping system as indicated on pipe schedule.
3. Pressure test piping system according to AWWA C600 and following:

    a. Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater.
    b. Conduct hydrostatic test for a minimum of two hours.
    c. Slowly fill section to be tested with water; expel air from piping at high points.
    d. Install corporation cocks at high points.
    e. Close air vents and corporation cocks after air is expelled.
    f. Raise pressure to specified test pressure.
    g. Observe joints, fittings, and valves under test.
    h. Remove and renew cracked pipes, joints, fittings, and valves showing visible

leakage, and retest.

i. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
j. Maintain pressure within plus or minus 5 psi of test pressure.
k. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
l. Compute maximum allowable leakage using following formula:

1) L = SD x sqrt(P)/C.
2) L = testing allowance, gph.
3) S = length of pipe tested, feet.
4) D = nominal diameter of pipe, inches.
5) P = average test pressure during hydrostatic test, psig.
6) C = 148,000.

m. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.
n. Leakage:

1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
2) Correct visible leaks regardless of quantity of leakage.

4. Compaction Testing:

a. Comply with ASTM D1557.
b. Frequency of Compaction Tests: Minimum every 2 feet of backfill lift .
c. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION 331416

SECTION 334100 - STORM UTILITY DRAINAGE 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.

B. PENNDOT Publication 408 specifications, Sections 601, 605, 610 and 850, latest revision. Use PennDOT Publication 408 for any discrepancies between specifications provided in this document and the PennDOT Highway Construction Specifications.

1.2 SUMMARY

A. Section Includes:

1. Stormwater Pipe and fittings.
2. Drainage Structures
3. Nonpressure transition couplings.
4. Encasement for piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Include plans, elevations, sections, reinforcement and details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

C. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle structures and pipe in accordance with manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Engineer's written permission.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.

1. Special-Joint Bands: Corrugated steel with O-ring seals.
2. Standard-Joint Bands: Corrugated steel.
3. Coating: Zinc.

2.2 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.

2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.3 CONCRETE PIPE AND FITTINGS

A. Nonreinforced-Concrete Pipe and Fittings: ASTM C 14, Class 1, with bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets.

B. Reinforced-Concrete Pipe and Fittings: ASTM C 76.

1. Bell-and-spigot ends and gasketed joints with ASTM C 443, rubber gaskets

2. Class as indicated.

C. Elliptical Reinforced Concrete: Pipe and Fittings: ASTM C 507.
   1. Apply flexible butyl resin sealant between sections of pipe; Conseal or Approved equal; ASTM C 990.
   2. Class as indicated.

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

   1. For Concrete Pipes: ASTM C 443, rubber.
   2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

   1. Manufacturers: Subject to compliance with requirements:

   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

      a. Dallas Specialty & Mfg. Co.
      b. Fernco Inc.
      c. Logan Clay Pipe.
      d. Mission Rubber Company; a division of MCP Industries, Inc.
      e. NDS Inc.
      f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
      g. Approved Equal.

   3. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

   1. Manufacturers: Subject to compliance with requirements:

   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

      a. Cascade Waterworks Mfg.
      b. Dallas Specialty & Mfg. Co.
      c. Mission Rubber Company; a division of MCP Industries, Inc.
      d. Approved equal.

   3. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Fernco Inc.
   b. Logan Clay Pipe.
   c. Mission Rubber Company; a division of MCP Industries, Inc.
   d. Approved Equal.

3. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

2.6 CATCH BASINS AND OUTLET STRUCTURES

A. Standard Precast Concrete Catch Basins. Catch basin item is for Type M Concrete Top Unit and Bicycle Safe Grate and a Standard Inlet Box, Height </= 10', per PennDOT Pub 408, Section 605.

1. Description: PennDOT Type M Inlet, PennDOT Pub 408, Section 605.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: Bicycle Safe Grates or Standard Grate, as indicated, PennDOT Pub 408, Section 605.

C. 4'-0" X 2'-0" Catch Basins
1. Catch Basin with a grate surface of 4'-0" X 2'-0".
2. Catch Basin Products:
   a. Old Castle Precast
   b. Monarch Products Company Inc.
   c. Or approved Equal

3. Frames and Grates: Heavy duty, according to PennDOT standards.
4. Trash Rack: According to detail.

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED STORM SEWERAGE SYSTEMS

A. Grade trench bottom to provide a smooth, firm, stable, and rock free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with AASHTO #8 backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

E. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, except where indicated otherwise.
2. Install piping 6-inch and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 12-inch minimum cover.
4. Install corrugated steel piping according to ASTM A 798/A 798M.

5. Install PE corrugated sewer piping according to ASTM D 2321.
6. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
7. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.4 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
2. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
3. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
4. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
5. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.5 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 STORMWATER INLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.7 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

B. Construct per details. Includes framing and all other items of work needed for a complete installation.

3.8 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains.
B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

2. Make branch connections from side into existing piping, 4 inch to 20 inch. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

3. Make branch connections from side into existing piping, 21 inch or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Division 31 Section "Earthwork."

3.10 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

SECTION 40 9119 - TEMPERATURE MONITORING 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. This Section includes requirements for the temperature monitoring equipment for Class A live fire burn rooms.

1.3 REFERENCE

A. National Fire Protection Association (NFPA)
   1. NFPA 1400 - Standard on Fire Service Training

B. American Society for Testing and Materials (ASTM) 14.03 Temperature Measurement

C. American Iron and Steel Institute (ASI), latest edition.

1.4 COORDINATION

A. Conduct a pre-installation conference at the project site.

1.5 PERFORMANCE REQUIREMENTS FOR TEMPERATURE MONITORING EQUIPMENT

A. The temperature monitoring system shall be specifically manufactured for and capable of registering and displaying temperatures in a training structure during live fire training. The system shall be compliant with ASTM standards and NFPA policies, codes, and manuals.
   1. Temperature range at the location of the recording equipment (control room) during normal operating conditions shall be between 40 degrees F and 120 degrees F.
   2. Temperature range during normal operating conditions at the temperature sensors shall be between 0 degrees F and 2,300 degrees F.

B. The system shall be independently capable of scanning and recording temperature readings for the number of thermocouples indicated.
   1. The system shall have a digital display that indicates readings during operation. The digital display shall be capable of displaying a minimum of 12 channels simultaneously and shall be readable at three feet line of sight. The display shall be readable in direct sunlight for exterior installations. The display shall have back lighting or be bright enough to read in low level light conditions such as a mechanical room. The units shall be capable of scanning continuously through readings from all of

the sensors. The scanning feature shall be capable of being programmed so that different sensors can be scanned or displayed during different training evolutions.

2. Control of the instrumentation shall be local and not require the use of an interface. Operation of the instrument shall be accomplished through a touch screen, push button, or soft key interface.
3. The instruments shall be capable of recording the total number of sensors installed in the burn building.
4. The system shall be capable of recording all of the channels at a 10 second or less interval.
5. All data shall be permanently stored on the internal memory.
6. The system shall be capable of storing data on removeable storage media, including PCMCIA/compact flash cards or USB external thumb drives.
7. The system shall interface with a computer via standard wireless interface, Ethernet, and USB. The system shall include Web Server based wireless interface. No special software shall be required for recorder monitoring. Program, data download, and other control features shall be available via wireless interface and software.
8. The system shall have at least one front panel USB port.
9. The system shall have a 70MB battery backed buffer.
10. The system shall come with software required to view and convert saved data to a format compatible with commercially available spreadsheet software, such as Lotus 1-2-3 and Microsoft Excel, for use and analysis in a personal computer with Windows format. The software shall be compliant for use with Windows 7-11.
11. Each system shall have at least two outputs to control audio visual alarms. Each channel shall have a minimum of two programmable alarm set points
12. The system shall be capable of displaying and recording temperatures in degrees Fahrenheit and degrees Celsius.The system shall have a front panel on/off switch.Data recording will start at power on or by no more than a single record command.
13. The system shall have sufficient internal memory to store at least 168 hours of continuous measurement data for all connected channels based on 1 second sampling interval. The data shall have a date and time stamp. All of the data shall also be stored on an external flash drive or other type of permanent memory storage. The system shall be capable of transferring or dumping data to an external storage device without erasing the internal memory.
14. Loss of power or turning the unit to the off position shall not affect the internal memory. A secondary back up power source is not permitted as an alternative.
15. The system shall have open sensor detection and in the event a sensor fails, the instrument shall initiate an alarm condition.
16. Data management:
    a. All data should be stored in a non-volatile internal memory continuously throughout the training period.
    b. All data should be date and time stamped specific.
    c. All data shall be transferred to a permanent storage media. The memory shall be sufficient to hold at least 30 days of continuous data.
    d. The data may also be downloaded via connection to a computer. The data should be exported and stored in a usable format compatible with commercially available spread sheet software.
    e. The data shall be encrypted and secured via the supplied software. The data shall be exportable to an unsecured CSV or Excel format.

C. Sensors

1. The sensors shall be manufactured for live fire conditions, harsh service and high reliability applications according to the appropriate ASTM standards.
2. Unless otherwise indicated, one ceiling mounted, wall, and structural sensor shall be installed in each live fire burn room.
3. The sensors shall be 1/8 inch diameter and a length that permits a minimum of 1.25 inches of extension into the live fire burn room.
4. Provide a stainless steel wall and ceiling sensor guard to protect the sensor from a live fire training environment. The guards shall be designed to not significantly affect the sensor reading.
5. Wall sensors shall be located between 35 and 42 inches above the finished floor

D. System Enclosure
1. The recorder enclosure shall be NEMA 4 or 4X rated.

E. Audio Visual Alarms
1. One red and one yellow flashing strobe is required at each building preferably mounted on the side commonly used as the staging area. One audio alarm capable of a minimum of 85 dB is also required at each building

F. Communications Cables
1. Single relay or signal hardware as required to support 325-foot runs. The cable shall be CMXT Cat 6 shielded (STP) cable, high performance data communication cable suitable for 600MHz high-speed data applications, gigabit Ethernet, fast Ethernet and 155 Mbps TP-PMD/CCDI. Attenuation and crosstalk characteristics should meet or exceed EIA/TIA 568 B.2-1, CSA and ISO/IEC 11801 specifications. The cables shall be suitable for direct burial outdoor network installations and approved by ETL to e type CMX. The wires shall be 23 AWG in size or larger and be made of solid bare (pure) copper conductors. All 4 pairs shall be identified by color-stripes. Insulations should be made of PE and the outer jacket be made of UV resistant LLDPE. The cable shall be equipped with AL Foil & waterproof tape with drain wire. Wireless connectivity at each building is required

G. Sensor locations shall be as indicated on drawings or at existing locations.

H. Wiring, conduit, and other miscellaneous electrical items shall be protected from high temperatures by installing them behind thermal linings inside the training structure. Installing wiring, conduit, and other miscellaneous electrical items outside the training structure shall not be accepted unless protection from temperature cannot be achieved inside the training structure.

I. The wiring shall be rated appropriately for use in rigid conduit protected by the appropriate lining or structural material. The wire shall comply with the appropriate ASTM standard.

J. A one-year follow-up maintenance service call shall be included as part of the system.

K. Sensor Hardware shall be compatible with High Temperature Linings (HTL) refractory tiles, standard fire brick wall linings, WHP Interlock, SRG Calcifrac, and other calcium silicate thermal linings

1.6 ACTION SUBMITTALS

A. General: Submit each item in this Article according to the General Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of product.

1. Product types that are included within this specification include, but are not limited to, instrumentation, sensors, wiring and enclosures, and all other products that comprise the complete thermal lining system and assembly.

C. Shop Drawings
1. Include plans, elevations, sections, and attachment details of temperature monitoring system.
2. Show large scale details.
3. Show locations and sizes of cutouts and holes for items installed in thermal lining system.

1.7 INFORMATION SUBMITTALS

A. Qualification Data: For manufacturer and installer.
1. Manufacturer: Provide the following information:
   a. Corporate qualifications and capabilities that fully describe the ability to manufacture the required temperature monitoring system.
   b. A history of experience manufacturing and installing temperature monitoring systems in live fire training structures (Burn Buildings.)
   c. A list of ten (10) completed projects, at least five (5) of which shall not be more than two (2) years old installing or fully servicing and testing temperature monitoring systems used by municipalities in live fire training structures. Include the completion date and the name and telephone number of a person employed by the Owner who has personal knowledge of the TMS performance. Provide all appropriate contact for the municipality. Also provide descriptions of any testing that has been performed on the system to indicate that it will have performance equal or greater to the performance criteria listed in this specification.
2. Installer: Provide the following information:
   a. Qualifications and capabilities that fully describe the ability to install the required temperature monitoring system.
   b. A history of experience installing and testing temperature monitoring systems in live fire training structures (Burn Buildings.)
   c. A list of ten (10) completed projects, at least five (5) of which shall be more than two (2) years old installing or fully servicing and testing temperature monitoring systems used by municipalities in live fire training structures. Include the completion date and the name and telephone number of a person employed by the Owner who has information for the municipality. Also provide descriptions of any testing that has been performed on the system to indicate that it will have performance equal or greater to the performance criteria listed in the specification.

B. Warranty: Provide manufacturer's standard warranty documentation for installed system.
1. Labor Warranty.
2. Material Warranty.

C. Maintenance and Operation Manuals: Provide maintenance and operation manuals in format required by specifications consisting of but not limited to the following:
1. Initial training burns on the use of the TMS, including instrument programming.
2. Maintenance Program: Consisting of, but not limited to, system/product specific outline and schedule of maintenance requirements.

1.8 QUALITY ASSURANCE

A. Temperature Monitoring Equipment and components shall be provided by a single manufacturer.

B. Fabricator's/Manufacturer's Qualifications:
1. 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.
2. Supplier shall have a minimum of 10 years' experience in the design, engineering, and fabrication of temperature monitoring equipment and systems commensurate with the requirements of this project.

C. Installer Qualifications: Installer shall be the supplier/manufacturer or shall be qualified by the supplier/manufacturer and shall have a minimum of 5 years' experience installing temperature monitoring systems on projects of similar size and scope.

1.9 WARRANTY

A. Supplier/Manufacturer shall provide a one (1) year warranty from the date of Substantial Completion warranting all components to be free from defects in materials and workmanship under normal use and service.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver system materials in manufacturer's original unopened containers or wrapped with labels intact and legible.

B. Store and protect materials from damage and weather in accordance with the manufacturer's instructions. Keep materials clean and dry at all times.
1. Components shall be stored above the ground, be separated, and protected from exposure to the elements and from physical damage caused by other activities.

C. During storage, space surfaces of materials to permit free circulation of air.

D. Handle materials in accordance with manufacturer's recommendations.

E. 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 TEMPERATURE MONITORING SYSTEM

A. Basis of Design Product/System: Subject to compliance with requirements provided, SRG Inc. model DAQ 100/400 Class A and Class B temperature monitoring system and components or comparable product by another manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install temperature monitoring system and all accessories in accordance with the manufacturer's written instructions and recommendations for use within a live fire training structure (Burn Building.)

3.2 SYSTEM TESTING

A. At initial installation and at the prescribed interval, the temperature monitoring system shall be tested. The inputs shall be tested using an appropriate calibrator and methodology. The alarm outputs and data storage should be verified. All panel annunciators or audio-visual alarms shall be verified.

B. The system shall be tested as a complete loop.

C. Calibrate and test the temperature monitoring system (TMS) in accordance with manufacturer's requirements. Program central recorder specifically to the requirements of the owner's training program.

3.3 CLEAN UP

A. Remove all debris, scraps, containers, and any other trash resulting from the installation of the TMS.

3.4 DEMONSTRATION TRAINING

A. Provide one qualified person for a minimum of one full day to demonstrate the system and train owner's personnel in the use and maintenance of the system. The amount of training time required depends on the complexity of the system. Multiple burns for each designated burn room are required.

B. Department personnel will be trained on the operation of the monitoring/recording system. In addition, they will be instructed on how the system functions and given specific instructions on maintain data integrity.

C. The first live burn test of the system shall be made independently of training and for the sole purpose of testing the system under live conditions. No system shall be used without first testing the system during live fire conditions. The system shall be programmed by the installed considering NFPA, state, and local policies. The initial burns shall also be for the purpose of programming the system to operate according to the municipalities training standard operating procedures (SOP's.)

D. Supply calibration data for the system with a written report of test and service. Perform other relevant diagnostic tests to assure proper system operation and to validate each sensor loop independently.

END OF SECTION 40 9119