

*May 14, 2025 – ADDENDUM 3*

# TREDYFFRIN EASTTOWN SCHOOL DISTRICT NEW ELEMENTARY SCHOOL

1200 W. Swedesford Road  
Berwyn, Pennsylvania 19312

For the Tredyffrin / Easttown School District  
940 West Valley Road, Suite 1700, Wayne, Pennsylvania, 19087 t 620 240 1900

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## SPECIFICATIONS

HSA Project No. 23-037

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END OF DOCUMENT

**NEW ELEMENTARY SCHOOL; 1200 W. SWEDESFORD RD.**

**TREDYFFRIN / EASTTOWN SCHOOL DISTRICT  
SUPPLEMENTARY GENERAL CONDITIONS  
FOR THE CONTRACT FOR CONSTRUCTION**

THE AMERICAN INSTITUTE OF ARCHITECTS Standard Form A-201, 1987 Edition, of the General Conditions of the Contract for Construction, Articles 1 through 14, pages 1 through 24 inclusive, are included as part of the specifications and will be binding upon all contractors, subcontractors and sub-subcontractors. However, said General Conditions are amended or modified as set forth in these Supplementary General Conditions. Where any section of the standard form is not specifically amended, deleted or supplemented hereby, it shall remain in effect as originally written. In the case of any conflict between the provisions of these Supplementary General Conditions and the General Conditions, the provisions of these Supplementary Conditions shall prevail.

**ARTICLE 1 - GENERAL CONDITIONS**

**Section 1.1.1** is amended by deletion of the first sentence thereof and by substitution of the following therefor:

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the "Agreement"), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, all Specifications including the General Requirements, Notice to Bidders, Instructions to Bidders, Bond forms, other documents listed in the Agreement and Modifications issued after execution of the Contract.

**Section 1.1.2** is amended by deletion of the last sentence thereof and by substitution of the following therefor:

The Architect shall, however, be entitled to performance and enforcement of those obligations of the Contractor under the Contract intended to facilitate performance of the Architect's duties.

**Section 1.2.1** is deleted in its entirety and the following is substituted therefore:

The Contract Documents shall be signed in not less than triplicate by the Owner and Contractor. If the Owner and/or the Contractor do not sign the Conditions of the Contract, Drawings, Specifications or any other Contract Document, the Architect shall identify such document for the Owner.

**Section 1.2.6** is added as follows:

The Specifications determine the standards of quality and the types and methods of workmanship; the Drawings establish the quantities, dimensions and details, the Drawings and Schedule give the location of materials.

Any discrepancies among, or omission in, the Contract Documents shall be called to the Architect's attention by the Contractor before proceeding with the Work affected thereby. In case of discrepancy among the Contract Documents regarding quantity or quality or both, the better quality and the greater quantity (as determined by the Architect) shall be included in the bid and the Contract and, unless otherwise directed in writing by the Architect, shall be performed or furnished.

Any conflict in the Drawings or Specifications as to which of the separate contractors is to perform specific Work, shall be resolved by the Architect, whose decision shall be final and binding.

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## **ARTICLE 2 - OWNER**

**Sections 2.1.2 and 2.2.1** are deleted in their entireties.

**Section 2.2.3** is deleted in its entirety and the following is substituted therefor:

The Owner shall secure and pay for any and all necessary land development approvals, zoning approvals, easements and assessments required for construction.

**Section 2.2.5** is deleted in its entirety and the following is substituted therefor:

General Contractors will be furnished with four copies of Drawings and Project Manuals, free of charge.

**Section 2.4.1** is deleted in its entirety and the following is substituted therefor:

If the Contractor fails within seven (7) days after written notice from Owner to correct defective or non-conforming Work or to remove and replace rejected Work as required by the Architect or Owner, or if the Contractor fails to perform Work in accordance with the Contract Documents (including any requirements of the Progress Schedule), the Owner may correct, remedy or complete such deficiency.

To the extent necessary to complete corrective and remedial action, the Owner may exclude the Contractor from all or part of the Work, and suspend the Contractor's services related thereto, take possession of the Contractor's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and machinery and equipment stored at the site as may be necessary to enable the Owner to exercise its rights under this Section. All direct and indirect costs of the Owner exercising such rights shall be charged against the Contractor in an amount verified by the Architect and a Change Order shall be issued incorporating (a) the necessary revisions in the Contract Documents and (b) a reduction in the Contract sum. Such direct and indirect costs shall include, in particular, but without limitation, compensation for additional services required and all costs of repair and replacement of Work of others destroyed or damaged by correction, removal or replacement of the Contractor's defective Work. The Contractor shall not be allowed any extension of the Contract Time because of any delay in performance of the Work attributable to exercise by the Owner of its rights hereunder.

## **ARTICLE 3 - CONTRACTOR**

**Section 3.1.1** is amended by addition of the following at the end thereof:

The term "Contractor" shall include the General Contractor, Mechanical Contractor, Plumbing Contractor and Electrical Contractor entering into a contract with the Owner.

**Section 3.3.5** is added as follows:

The Contractor covenants with the Owner to furnish its best skill and judgment and to cooperate with the Architect and Owner in furthering the interests of the Owner. The Contractor agrees to furnish efficient business administration and Superintendents and to use its best effort to furnish at all times an adequate supply of workers and materials and to perform the Work in the most efficient and expeditious manner consistent with the interests of the Owner.

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**Section 3.5.1** is deleted in its entirety and the following is substituted therefor:

The Contractor warrants to the Owner and Architect that materials and equipment furnished under this Contract will be new unless otherwise specified, and all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. Contractor further warrants that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective. If requested by the Owner or Architect, the Contractor shall furnish satisfactory evidence as to the kind and/or quality of materials and equipment. The Contractor shall collect and deliver to the Architect or Owner all written warranties given to Owner by others for the Project Work.

**Section 3.6.1** is deleted in its entirety and the following is substituted therefor:

The Contractor and all subcontractors and sub-subcontractors must comply with all laws governing the payment of sales tax, consumer, use and similar taxes related to the Work.

The Contractor shall check all materials, equipment and labor entering into the Work. In form and system satisfactory to the Owner, the Contractor shall keep such full and details accounts as may be necessary for proper financial management under this Contract. The Owner or its representative shall be afforded access to all the Contractor's records, books correspondence, instructions, drawings, receipts, vouchers, memoranda and similar data relating to this Contract. The Contractor shall preserve all such records for a period of three (3) years or for such longer period as may be required by law, after final payment.

The Contractor agrees to assign and transfer to the Owner all of its rights to sales and use tax which may be refunded as a result of a claim for a refund for materials purchased in connection with this Contract. The Contractor further agrees that it will not file a claim for refund of any sales or use tax which is the subject of this assignment.

The Contractor agrees to include the provisions of this Section 3.6.1, in full, in any contracts with subcontractors and to require that subcontractors include same in contracts with sub-subcontractors.

**Section 3.7.1** is deleted in its entirety and the following is substituted therefor:

Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for building permits and for all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work. It shall be the Owner's responsibility to reimburse the Contractor for a local "building" permit, which will be obtained from and required by Tredyffrin Township. In addition, the Contractor shall pay for and secure necessary Use and Occupancy permits prior to requesting issuance of a Certificate of Substantial Completion. Further, the Contractor shall pay all charges of utility service companies for connection to the Work. The Owner shall pay charges of companies for capital costs related to such utilities, including, for example, a sewer tapping fee.

**Section 3.7.3** is deleted in its entirety and the following is substituted therefor:

If the Contractor observes that portions of the Contract Documents or the Work are at variance with current laws, ordinances, rules, regulations, permits or other lawful orders of public authorities, the Contractor shall promptly notify the Architect and Owner in writing so that necessary changes may be accomplished by appropriate modification.

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**Section 3.7.5** is added as follows:

The Contractor shall comply with all applicable federal and state laws, local ordinances, statutes, building codes, highway regulations, and with all regulations and requirements of the Department of Education, Bureau of Labor and Industry and Department of Transportation of the Commonwealth of Pennsylvania. As set forth in Article 13, the Contractor shall comply with all provisions of the Prevailing Wage Act. A schedule of prevailing wage rates is included with the specifications.

**Section 3.8**, including subsections 3.8.1 and 3.8.2, is deleted in its entirety.

**Section 3.9.2** is added as follows:

Prior to execution of the Contractor-Owner Agreement, the Contractor shall submit to the Architect, and the Owner an updated résumé and other supporting documentation of experience and competency for the proposed superintendent on the Project. Should the Owner or the Architect find the proposed superintendent unacceptable for any reason, the Contractor shall submit additional names and résumés for consideration by the Owner and Architect. Once hired, the Contractor shall not replace its superintendent without prior notice to the Owner. The requirements contained in this Section shall apply to any proposed replacement superintendent regardless of whether the proposed tenure of the superintendent is temporary or permanent.

**Section 3.13.1** is deleted in its entirety and the following is substituted therefor:

The Contractor shall confine operations at the site to times and areas permitted by the Owner, law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

**Section 3.15.3** is added as follows:

As the buildings and site will be occupied during a part of the construction, the Contractor will be responsible on an ongoing basis to keep construction dirt from finding its way into or infiltrating any occupied areas. This responsibility shall apply to inside areas, outside paving and play areas and lawns. The Contractor shall also be responsible for cleaning construction dirt and mud from internal roadways, parking lots and adjacent roads. At the end of each work day during the course of construction, the Contractor shall clean and remove all dirt, dust and debris from the site. Dust shall be kept to a minimum at all times. It is the responsibility of the contractor to provide any equipment necessary for dust control. In addition to removal of dirt, dust and debris on a daily basis, at the completion of the Project and prior to request for final payment, the following additional clean up shall be completed:

- A. Removal of all stains, marks, fingerprints, mortar or paint spots and other defacements from all finished Work both exterior and interior including, but not limited to, finishing hardware, tilework, cabinet work, glass, etc.;
- B. clean all fixtures and equipment.
- C. and vacuum and/or wash all finish floors.

**Section 3.18.1** is deleted in its entirety and the following is substituted therefor:

The Contractor agrees to protect, defend, indemnify and hold the Owner (Tredyffrin/Easttown School District) and its agents and agencies, the Architect, the Engineer, and any other party specifically named by the Owner, free and harmless from and against any and all losses, penalties, damages, settlements, costs, charges, professional fees or other expenses or liabilities of every kind and character arising out of or

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relating to any and all claims, liens, demands, obligations, actions, proceedings, or causes action of every kind and character in connection with or arising directly or indirectly out of the Contract and/or the performance thereof. Without limiting the generality of the foregoing, any and all such claims, etc., relating to personal injury, death, damage to property, defects in materials or workmanship, actual or alleged infringement of any patent, trademark, copyright (or application for any other tangible or intangible personal or property right), or any actual or alleged violation of any applicable statute, ordinance, administrative order, rule or regulation, or degree of any court, shall be included in the indemnity hereunder. The Contractor further agrees to investigate, handle, respond to, provide defense for and defend any such claims, etc., at its sole expense and agrees to bear all other costs and expenses related thereto, even if it (claims, etc.), is groundless, false or fraudulent. This indemnification shall apply to the acts or omissions of the Contractor, any subcontractor, or any one directly or indirectly employed by any of them or any one for whose acts any of them may be liable, regardless of whether or not caused in part by a party indemnified hereunder. In the event such indemnification violates any law, the foregoing provisions shall not be construed to indemnify the Owner and its agents and agencies and the Architect and the Engineer for liability arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of those parties.

#### **ARTICLE 4 - ADMINISTRATION OF THE CONTRACT**

**Section 4.1.3** is deleted in its entirety and the following is substituted therefor:

In case of termination of employment of the Architect, the Owner shall appoint an Architect whose status under the Contract Documents shall be that of the former Architect.

**Section 4.1.4** is deleted in its entirety.

**Section 4.2.5** is amended by addition of the following at the end thereof:

Except for requests for payment for changes in the Work which require approval of Board of School Directors, the Architect shall have seven (7) days to review Contractor's payment requests and payment shall be made thirty-two (32) days from the Architect's receipt of the request where the Owner and Architect approve of same. No request for payment will be approved unless accompanied by verified statements certifying payment of prevailing wages under the Prevailing Wage Act for all Work for which payment request is made.

**Section 4.2.6** is amended by addition of the following at the end thereof:

In addition to the Architect, the Owner will have authority to reject work which does not conform to the Contract Documents. The Architect and the Owner shall at all times have access to the Work wherever it is preparation and/or progress. The Contractor shall provide facilities for such access.

**Section 4.2.11** is deleted in its entirety and the following is substituted therefor:

The Architect will interpret matters concerning performance and requirements of the Contract Documents upon written request of either the Owner or the Contractor. Architect's response to such requests will be made with reasonable promptness as agreed upon but in no event later than fifteen (15) days after the Architect's receipt of the written request. The Owner shall decide matters concerning performance under and requirements of the Contract Documents. The decisions of the Owner shall be consistent with the intent of or reasonably inferable from the Contract Documents and decisions will be issued in writing or in the form of drawings.



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**Section 4.5**, including subsections 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.5.4.1, 4.5.4.2, 4.5.5, 4.5.6 and 4.5.7, is deleted in its entirety. A new **Section 4.5** is added as follows:

Any controversy or claim arising out of or related to the Contract or breach thereof that is not resolved pursuant to the provisions of Section 4.4 may be brought in a civil action by the Owner or Contractor in the Court of Common Pleas of Chester County. The Owner may at its sole discretion elect to submit its claim to non-binding mediation and/or binding arbitration. However, prior to the Contractor commencing an action in the Court of Common Pleas of Chester County, the Contractor is required to submit written notice to the Owner of its intent to commence an action upon the Owner, and the Owner, at its sole discretion, may demand that the matter be submitted to mediation and/or arbitration. If the Owner elects that any claim be submitted to arbitration, the arbitration shall be in accordance with the construction industry arbitration rules of the American Arbitration Association. During the Court of Common Pleas proceedings, mediation proceedings and/or arbitration proceedings, the Owner and Contractor shall comply with sub paragraph 4.3.4.

#### **ARTICLE 5 - SUBCONTRACTORS**

**Section 5.3.2** is added as follows:

The Owner shall have the right, but not the obligation, to pay subcontractors directly if the Architect advises the Owner that, in his opinion, failure of the Contractor to pay the subcontractor in question would be detrimental to the progress of the Work. In such cases, the Owner may withhold from the prime Contractor, money believed to be due the subcontractor and to pay the subcontractor directly. The Owner or the Architect may furnish to any subcontractor or sub-subcontractor or any other person or organization, evidence of amounts paid to the Contractor on account of the specific Work done by the subcontractor or sub-subcontractor.

#### **ARTICLE 6 - WORK BY OWNER OR BY SEPARATE CONTRACTORS**

**Section 6.1.1** is deleted in its entirety and the following is substituted therefor:

The Owner reserves the right to perform work related to the Project with its own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar conditions of the Contract. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, he shall make such claim as provided elsewhere in the Contract Documents.

**Section 6.1.3** is deleted in its entirety and the following is substituted therefor:

The Contractor shall be responsible for coordinating all work activities on the project and prepare construction schedules, including revisions thereto, when appropriate, for the efficient coordination of the work. The resulting construction schedules shall be used by the Contractor and the Owner until subsequently revised.

**Section 6.1.4** is deleted in its entirety.

**Section 6.2.4** is amended by addition of the following at the end thereof:

Any losses, damages, costs, charges or expenses caused by defective or ill-timed Work shall be borne by the Contractor, who shall be responsible to the Owner therefor.

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**Section 6.2.7** is added as follows:

Should the Contractor cause damage to the Work or property of any subcontractor or should any claim arising out of the Contractor's performance of Work at the site be made by any separate contractor against the Contractor, the Owner or any other person, the Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute. The Contractor shall, to the fullest extent permitted by law, indemnify and hold the Owner and the Architect harmless from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, court and arbitration costs, arising out of any action, legal or equitable, brought by any separate contractor on a claim arising out of the Contractor's Work at the site. Should a separate contractor cause damage to Work or property of the Contractor, or should the Work of any separate contractor at the site give rise to any other claim, the Contractor covenants and agrees that it will not institute any action against the Owner or the Architect to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from the Owner or the Architect on account of any such damage or claim. If the Contractor is delayed at any time with the progress of the Work by any act or neglect of a separate contractor, the Contractor shall make a request to the Architect and Owner for an extension of time within fifteen (15) days of occurrence of the act or neglect of such separate contractor giving rise to the delay. Notwithstanding anything in the General Conditions to the contrary, no extension of time shall be granted if the Contractor fails to notify the owner and the Architect of any such delay within the said fifteen (15) day period. An extension of the Contract time shall be the Contractor's exclusive remedy with respect to the Owner for any delay caused by a separate contractor.

## **ARTICLE 7 - CHANGES IN THE WORK**

**Section 7.1.2.1 and 7.1.2.2** are added as follows:

**7.1.2.1** The process for a Change Order shall be as follows:

- .1 If the Contractor believes a Change Order may be necessary the issue should first be discussed with the Architect or respective Engineer.
- .2 If it is deemed necessary then a complete and clear written description of the work, along with detailed cost breakdown, shall be submitted to the Architect for review.
- .3 Following review, and approval by the Owner, the Contractor will be directed to start work. No work should take place without the Owner's approval.

**7.1.2.2** When no unit prices are included and when the actual cost of the Work forms the basis for the amount to be paid to the Contractor, the Contractor shall add overhead and profit according to the following:

- .1 No more than fifteen percent (15%) shall be added to the cost of the Work if it is work done by the Contractor. Supervision, labor, material and equipment define the cost of the Work. Said fifteen percent (15%) shall be all-inclusive and no additional charges for items such as insurance or bonds will be approved.
- .2 No more than Eight percent (8%) shall be added to the cost of the Work done by subcontractors or sublet. Said eight percent (8%) shall be all-inclusive and no additional charges for items such as insurance or bonds will be approved.
- .3 A subcontractor may add no more than ten percent (10%) to the cost of the work. Supervision, labor, material and equipment define the cost of the Work. Said ten percent (10%) shall be all-inclusive and no additional charges will be approved.

**Section 7.3.3.2** is deleted in its entirety and the following is substituted therefor:

Unit prices are set forth in the Contract Documents or subsequently agreed upon. Fifteen percent (15%) to cover overhead, coordination and profit shall be added to changes which increase the scope of the work.

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Costs associated with overhead, coordination and profit will not be included on changes which decrease the scope of the work. Under no conditions shall additional charges such as insurance or bond be approved.

**Section 7.3.3.3** is deleted in its entirety and the following is substituted therefor:

When no unit prices are included and when the actual cost of the Work forms the basis for the amount to be paid to the Contractor, the Contractor shall add overhead and profit according to the following:

- (a) No more than fifteen percent (15%) shall be added to the cost of the Work if it is work done by the Contractor. Supervision, labor, material and equipment define the cost of the Work. Said fifteen percent (15%) shall be all-inclusive and no additional charges for items such as insurance or bonds will be approved.
- (b) No more than Eight percent (8%) shall be added to the cost of the Work done by subcontractors or sublet. Said eight percent (8%) shall be all-inclusive and no additional charges for items such as insurance or bonds will be approved.
- (c) A subcontractor may add no more than ten percent (10%) to the cost of the work. Supervision, labor, material and equipment define the cost of the Work. Said ten percent (10%) shall be all-inclusive and no additional charges will be approved.

**Section 7.3.7** is amended by deletion of the last sentence thereof and substitution of the following therefor:

Any change in the Contract Sum resulting from such claim shall be authorized by Change Order and calculated as set forth in Section 7.3.3.

**Section 7.5.1** is added as follows:

If notice to any surety of any change effecting the general scope of the Work or change in the Contract Sum is required by the provisions of any bonds, it will be the Contractor's responsibility to so notify the surety, and the amount of each applicable fund shall be adjusted accordingly. The Contractor shall furnish proof of such adjustment to the Owner.

## ARTICLE 8 - TIME

**Section 8.3.1** is deleted in its entirety and the following is substituted therefor:

Except as otherwise provided in Section 8.3.3, if the Contractor is delayed in progress of the Work by an act or neglect of the Owner, the Architect or any other contractor, or by causes beyond Contractor's control and without Contractor's fault or negligence, or by cessation of Work which shall be authorized by the Owner or the Architect or by any other cause which the Owner shall determine to be proper, then the time of completion determined as provided may be extended by the Owner for such reasonable time as the Owner, with advice from the Architect, shall determine to be equitable and just.

**Section 8.3.3** is deleted in its entirety and the following is substituted therefor:

No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion, or within the period within any extension granted. Any additional cost of operations or conditions shall be the responsibility of the Contractor. The Contractor hereby agrees that it shall have no claim for damages of any kind on account of any delay in the commencement of the Work, and/or any delay or suspension of any portion of the Work, whether such

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delay is caused by the Owner, the Architect or otherwise. The Contractor acknowledges that its sole remedy for any such delay and/or suspension will be an extension of time as provided herein.

**Section 8.3.4** is added as follows:

No extension of time for completion shall be granted unless a claim or request therefor shall be made, in writing, to the Owner or the Architect by the Contractor within seven (7) days of the occurrence or act which the Contractor believes entitles it to an extension of time of completion; provided, however, if the occurrence or act shall constitute a continuing case of delay, only one claim or request by the Contractor shall be necessary. Failure of the Contractor to make a claim or request for an extension within the seven (7) day period shall constitute a waiver and relinquishment of the right of the Contractor to make a claim or request for an extension of time of completion based upon such act or occurrence, at any time in the future.

**Section 8.3.5** is added as follows:

No extension of time of completion will be granted by the Owner if the act or occurrence constituting the basis of the request or claim therefor by the Contractor shall be the non-delivery of materials due to any act or neglect of the Contractor, or the breakdown of equipment in use or intended to be used by the Contractor, or the failure of the Contractor to order, employ, furnish or obtain as necessary for the timely prosecution of the Work, sufficient labor, material, equipment or other matters which shall be within the control of the Contractor. The Contractor shall be solely responsible to the Owner for delays resulted from the causes set forth herein or for the Contractor's failure to make timely claim as set forth in Section 8.3.4.

**Section 8.3.6** is added as follows:

No extension of time of completion which shall be granted by the Owner shall be or shall be deemed to be a waiver by the Owner of any rights accruing to it under the Contract Documents and no extension of the time of completion which shall be granted by the Owner shall relieve the Contractor from full responsibility for the performance of its obligations under the Contract.

**Section 8.3.7** is added as follows:

The Owner shall not be liable to the Contractor for any expenses, damages, loss of profits (anticipated or otherwise) or charges of any nature whatsoever which shall result from the Owner's granting of an extension of the time of completion to any contractor or which shall result because of any delay or hindrance of any nature whatsoever in the progress of the Work, whether such delay or hindrance shall be avoidable or unavoidable. If the Owner actively interferes with the Contractor's progress of the Work, then the Owner may be responsible for costs actually, necessarily, and reasonably incurred by the Contractor as the direct result of the Owner's active interference if (1) the Contractor provided prompt written notice of the active interference, (2) the costs claimed are not otherwise disclaimed in the Contract Documents, and (3) neither the Contractor, nor any third party was also for the delay or a concurrent delay. The time of completion (which shall give effect to any extensions of time of completion which shall be granted by the Owner) shall be of the essence of the Contract and Contract Documents.

**Section 8.3.8** is added as follows:

Before starting the Work, the Contractor shall submit a Work Progress Chart, week by week, for the entire estimated period of performance of the Work. In the event it becomes apparent to the Contractor that a delay of any nature will cause a deviation from the schedule set forth in the Work Progress Chart, the Contractor shall immediately notify the Architect in writing of such fact and shall provide to the Owner and the Architect satisfactory proof of diligent efforts to rectify the delay.

**Section 8.3.9** is added as follows:

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Damages will result to the Owner by virtue of the failure of the Contractor to substantially complete this Project not later than the date set forth in the Contract. It is therefore agreed that liquidated damages as set forth in the Instructions to Bidders shall be charged and payable by the Contractor to the Owner for each calendar day, or part thereof, of delay beyond the Substantial Completion Date. The Contractor acknowledges and agrees that these damages are conclusively reasonable and are not in any way punitive. In no case shall the total assessed damages be limited to any specific fixed sum. The Owner agrees that the date when such liquidated damages shall cease to accrue shall be the date that the Architect advises Owner that the Project is substantially complete and that a Use and Occupancy Permit has been issued.

## ARTICLE 9 - PAYMENTS AND COMPLETION

**Section 9.3.1** is deleted in its entirety and the following is substituted therefor:

In accordance with the Owner-Contractor Agreement, the Contractor's itemized applications for payment for operations completed in accordance with the Schedule of Values shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from subcontractors and material suppliers and prevailing wage payment certifications. Such applications shall reflect the required retainage, as set forth in the contract documents.

**Section 9.3.1.1** is deleted in its entirety and the following is substituted therefor:

Architect and Owner approved requests for payments, or portions thereof, will be paid by Owner within thirty-two (32) days of the Architect's receipt of the request for payment less retainage as set forth in the contract documents. The Architect must review completed applications for payment within seven (7) days of receipt of same from the Contractor. Applications for payment resulting from construction Change Directives and construction Change Orders require approval of the Board of School Directors; payment on same may be made outside of the thirty-two (32) day period set forth above, but will be paid promptly upon Board approval.

**Section 9.3.2.1** is added as follows:

In order for storage of materials offsite the Contractor must provide proof of purchase, proof of applicable insurance, must be located within a 50 mile radius of the project site, and must be visually inspected by the Owner or Architect.

**Section 9.6.1** is deleted in its entirety and the following is substituted therefor:

The Owner shall make a determination with respect to and make payment in the manner and within the time provided in the Contract Documents but no recommendation or certification of the Architect with respect to same shall be binding upon Owner.

**Section 9.7**, including its subsection, is deleted in its entirety.

**Section 9.8.1** is amended by addition of the following at the end thereof:

In no event shall the Work be deemed substantially complete until such time as the Contractor has obtained a Use and Occupancy Permit for the Project.

**Section 9.8.3** is deleted in its entirety and the following is substituted therefor:

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Upon receipt of a Certificate of Substantial Completion from the Architect, the Owner shall make its own assessment as to whether the Work is substantially complete under the terms of the Contract. Owner shall not be bound by certification by the Architect with respect to Substantial Completion. Payment to the Contractor upon Substantial Completion shall be in the same manner as progress payments.

**Section 9.10.1** is amended by addition of the following sentence at the end thereof:

Upon Final Completion of the Work and the Architect's final certificate for payment, the Owner shall make its determination with respect to Final Completion. A Certificate by the Architect with respect to Final Completion shall not be binding upon the Owner.

**Section 9.10.2** is amended by adding the following sentence at the end thereof:

The request for final payment must contain a certification of compliance with the Prevailing Wage Act.

**Section 9.10.3** is amended by deletion of the last sentence thereof.

**Section 9.10.5** is added as follows:

The making of final payment shall not constitute a waiver of any claims by the Owner, including, without limitation, those arising from:

- (a) Liens, claims, security interests, or encumbrances arising out of the Contract and unsettled;
- (b) Faulty or defective Work;
- (c) Failure of the Work to comply with the requirements of the Contract Documents; or
- (d) Terms of any special warranties required by the Contract Documents.

**Section 9.10.6** is added as follows:

The Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the Architect nor the issuance of a certificate of Substantial Completion or Final Completion, nor any payment by the Owner to the Contractor under the Contract Documents, nor use or occupancy of the Work or any part thereof by the Owner nor any failure to do so, nor the issuance of notice of acceptability by the Architect, nor any correction of defective Work by the Owner shall constitute an acceptance of Work not in accordance with the Contract Documents (as may be amended in writing from time to time) shall constitute a release of the Contractor's obligation to perform the Work in accordance with the Contract Documents.

**Section 9.10.7** is added as follows:

At the time of signing the Agreement, the Contractor shall execute a separate agreement waiving, for himself and all subcontractors and material suppliers, the right to file any lien against the building. The waiver shall be filed with the Prothonotary prior to starting work on the Project. At the completion of the Work, the Contractor shall furnish a complete and executed Release of Liens. Final payment shall not be due until the Release of Liens is furnished to the Architect.

## ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

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**Section 10.1.4** is deleted in its entirety and the following is substituted therefor:

Contractor agrees that it will not use nor permit to be used by any of its subcontractors, any asbestos containing materials in the Work. Contractor must submit a signed letter at the completion of the Work certifying that it has complied with this Section.

**Section 10.2.1** is amended by the addition of a new subsection as follows:

- .4 When the Contractor is using any compressed or liquefied gas, or any highly flammable liquid, the containers or tanks must be securely tied or chained to a fixed structure.

## ARTICLE 11 - INSURANCE

**Section 11.1.2** is deleted in its entirety and the following is substituted therefor:

Contractor shall purchase required insurance from a company or companies lawfully authorized to do business in the Commonwealth of Pennsylvania which company or companies must have a BEST rating no lower than "A-" and be no lower than a CLASS VII. The Contractor must secure insurance of the following types and in the following limits, at a minimum:

1. Workers' Compensation - Insurance as required by the Commonwealth of Pennsylvania or any applicable labor union contracts, whichever is higher;
2. Comprehensive General Liability - including Premises - Operations; Independent Contractors Protective; Products and Completed Operations; Broad Form Property Damage and Contractual Liability
  - (a) ***\$1,000,000 per occurrence, \$3,000,000 aggregate per contract.***
  - (b) Liability Insurance shall provide X, C, or U coverage, as applicable
3. Comprehensive Automobile Liability and Truck Insurance with a combined single limit of no less than \$1,000,000;
4. Umbrella Excess Liability Insurance with a minimum limit of liability of \$30,000,000 for each occurrence;
5. Professional Liability Insurance for delegated design responsibilities with a minimum limit of liability of \$1,000,000 for each occurrence.

The general liability and umbrella excess policies shall name the Owner and the Architect as additional insureds and shall include coverage for the following:

1. Explosion, Collapse and Underground Liability, as applicable;
2. Contractual Liability;
3. Products and Completed Operations Liability;
4. Owner's and Contractor's Protective Liability;
5. Blasting - in an amount sufficient to cover any damage suffered by the Owner and/or the general public;

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6. ~~*Building Collapse—in an amount sufficient to cover damages suffered by Owner and/or the general public, but no less than \$30,000,000; (deleted)*~~
7. Contractual Liability;
8. Independent Contractor's Liability;
9. Automobile Liability and Truck Insurance in an amount not less than \$1,000,000 as a combined single limit; and
10. Public Liability and Property Damage.

**Section 11.1.3** is deleted in its entirety and the following is substituted therefor:

Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to the commencement of Work. Said certificates shall contain the following provisions:

- (a) That the Owner and the Architect are included thereon as additional insureds, with the exception of professional liability; and
- (b) That the coverage afforded by the policies will not be canceled, allowed to expire or materially changed until at least thirty (30) days' prior written notice has been given to the Owner. All such insurance shall remain in effect until final payment and at all times thereafter when the Contractor may be correcting, removing or replacing defective Work in accordance with the Contract Documents. If any of the foregoing insurance coverages are required to remain in force after final payment, an additional insurance certificate evidencing continuation of such coverage shall be submitted with the final application for payment. If the Owner has any objection to the coverage afforded by, or other provisions of, the insurance required to be purchased and maintained by the Contractor on the basis of its failure to comply with the Contract Documents, the Owner shall notify the Contractor in writing within thirty (30) days of delivery of the certificates to the Owner. The Contractor shall provide to the Owner such additional information with respect to the insurance as the Owner may request. Failure of the Owner to timely object shall not constitute a waiver of Owner's rights and Contractor's obligation to provide insurance coverage as specified in the Contract Documents. Any amendments or endorsements to coverage shall be promptly furnished to the Owner by the Contractor.

**Section 11.2.1** is deleted in its entirety and the following is substituted therefor:

The Owner shall be responsible for purchasing and maintaining its own liability insurance and, at its option, may purchase and maintain such other insurance as will protect Owner against claims which may arise from operations under the Contract. Unless otherwise provided in the Contract Documents, the Owner shall purchase and maintain property insurance upon the Work at the site in the full insurable value thereof subject to such deductible amounts as may be provided in the Contract Documents or required by law.

**Sections 11.3.1, 11.3.1.1, 11.3.1.2, 11.3.1.3, 11.3.1.4, 11.3.2 and 11.3.3** are deleted in their entireties and the following **Section 11.3.1** is substituted therefor:

Owner's property insurance shall include the interests of the Owner and the Architect in the Work. Such insurance shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage, including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Contract Documents. Said insurance shall include



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losses and expenses arising out of or resulting from any insured loss or loss incurred in the repair or replacement of any insured property, including fees and charges of architects, engineers, attorneys and other professionals. If not covered under the "all risk" insurance or otherwise provided in the Contract Documents, the Contractor shall purchase and maintain similar property insurance on portions of the Work stored on and off site or in transit when such portions of the Work are to be included in an application for payment. The policies of insurance required to be purchased and maintained by the Owner shall contain a provision that the coverage afforded shall not be canceled or materially changed until at least thirty (30) days' prior written notice has been given to the Contractor. The Owner shall not be responsible for purchasing and maintaining any property insurance to protect the interests of the Contractor, subcontractors, sub-subcontractors or the Architect in the Work to the extent of any deductible amounts that are provided in the Contract Documents. If the Contractor desires to obtain property insurance coverage within the limits of such deductible amounts, the Contractor may purchase and maintain same at its own expense.

**Section 11.3.6** is deleted in its entirety and the following is substituted therefor:

The Owner shall file a copy of all policies with the Contractor before an exposure to loss may occur. If the Contractor has an objection to the coverage afforded by, or other provisions of, the policies of insurance purchased by Owner on the basis of failure of same to comply with the Contract Documents, the Contractor shall notify the Owner in writing within ten (10) days of delivery of such certificates to the Contractor. The Owner shall provide the Contractor such additional information with respect to the insurance provided by Owner as the Contractor may reasonably request. Failure by the Contractor to give such notice of objection within the time provided will constitute acceptance of such insurance purchased by the Owner as complying with the Contract Documents.

**Section 11.3.9** is deleted in its entirety and the following is substituted therefor:

Upon occurrence of any insured loss, the Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If, after such loss, no other special agreement is made, replacement of damaged Work shall be covered by an appropriate Change Order.

**Section 11.3.10** is deleted in its entirety and the following is substituted therefor:

The Owner, as fiduciary, shall have the power to adjust and settle any loss with the insurers.

**Section 11.4.1** is deleted in its entirety and the following is substituted therefor:

At the time of execution of the Agreement, the Contractor shall provide Owner with a Performance Bond and Maintenance Bond, and a Labor and Materialmen's Bond, with a surety company approved by the Owner on the specific forms for same included in the Specifications. Contractor is advised that said forms of bond are not identical to standard AIA form bonds. Said bonds shall be in an amount of 100% of the Contract price. The Contract Bonds required shall have as surety thereon a corporation duly authorized to conduct business in Pennsylvania which is satisfactory to the Owner. The bond shall be provided by a surety with a Best rating of "A-" or better.

A new **Section 11.5.1** is added as follows:

The Contractor agrees to accept, insofar as the Work covered by the Contract is concerned, the provisions of the Workers' Compensation Act of 1915, and any supplements or amendments thereto which have and which may hereafter be passed; and the Contractor will insure his liability thereunder, or file with the Commonwealth of Pennsylvania and with the Owner, a certificate of exemption of insurance from the Bureau of Workers' Compensation of the Department of Labor and Industry in accordance with the

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provisions of the Act of the General Assembly of the Commonwealth of Pennsylvania, approved July 18, 1917 (PL1083) as amended, and all other provisions of the Workers' Compensation Law now in force.

The Contractor shall provide insurance covering special hazards, as herein specified, and he shall supplement the insurance specified with additional insurance to cover himself and the Owner from any and all hazards encountered.

Neither the Contractor nor any subcontractor shall commence Work under the Contract until the Contractor has obtained all insurance required by the Contract Documents and such insurance has been approved by the Owner. The insurance certificates shall be issued covering all subcontractors as well as the Contractor.

Unless such employees are covered by the Contractor's Workers' Compensation Policy, the Contractor shall require and provide proof that each subcontractor provides Workers' Compensation insurance for all of their employees and sub-subcontractors.

#### **ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK**

**Section 12.1.2** is amended by deletion of the last sentence therein and by substitution of the following therefor:

If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner or separate contractor responsible shall pay such costs.

**Section 12.2.1** is amended by deletion of the first sentence thereof and by substitution of the following therefor:

The Contractor shall promptly correct Work rejected by the Architect or Owner or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed.

**Section 12.2.4** is deleted in its entirety and the following is substituted therefor:

If the Contractor fails to correct non-conforming or defective Work within a reasonable time, the Owner may correct it in accordance with Section 2.4.1. If the Contractor does not pay the cost of such removal and storage within ten (10) days, the Owner may dispose of the material in the most expeditious way. Costs incurred shall be charged to the Contractor by Change Order. If payments due the Contractor are insufficient to cover such amount, the Contractor shall pay the difference to the Owner.

#### **ARTICLE 13 - MISCELLANEOUS PROVISIONS**

**Section 13.3.2** is added as follows

Written notice shall be by means of electronic email.

**Section 13.4.1** is deleted in its entirety and the following is substituted therefor:

The duties and obligations imposed by the Contract Documents and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon the Contractor and all of the rights and remedies available to the Owner and the Architect hereunder, shall be in addition to and shall not be construed in any way as a limitation of rights and remedies available to any or all of them which are otherwise imposed or available by law or contract, by special warranty or guarantee or other provision of the Contract Documents. The provision of this Section shall be as effective as if repeatedly specified in the Contract Documents in connection with each

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particular duty, obligation, right and remedy to which they apply. All representations, warranties and guarantees made in the Contract Documents shall survive the final payment and termination or completion of the Project and the Contract.

**Section 13.4.2** is deleted in its entirety and the following is substituted therefor:

No act or failure to act by the Owner or Architect shall constitute a waiver of any right or duty afforded either of them under the Contract Documents, nor shall any such action or failure to act constitute an approval of or acquiescence to any breach thereunder, except as may be specifically agreed in writing.

**Section 13.5.1** is amended by deletion of the last sentence thereof.

**Section 13.5.2** is amended by deletion of the last sentence thereof and by substitution of the following sentence therefor:

If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents or the requirements of law, the Contractor shall bear all costs thereof, including compensation for the Architect's additional services made necessary by such failure; otherwise, the Owner shall bear such costs and an appropriate Change Order will be issued.

**Section 13.5.3** is deleted in its entirety and the following is substituted therefor:

If such procedures for testing, inspection, or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor The Contractor shall bear all costs made necessary by such failure including those of repeated procedures, including additional testing and inspections, and compensation for the Architect's services and expenses.

A new **Section 13.8.1** is added as follows:

In the event the Owner demands arbitration pursuant to Section 4.3, such arbitration shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, then obtaining, unless the parties mutually agree otherwise. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation, joinder or in any other manner, parties other than the Owner, the Contractor and any other person substantially involved in a common question of law or fact, whose presence is required if complete relief is to be accorded in the arbitration. In the event of such arbitration, the award rendered by the arbiters shall be final and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

Notice of Owner's demand for arbitration shall be filed in writing with the Contractor and with the American Arbitration Association, and a copy thereof shall be filed with the Architect. The demand for arbitration shall be made within the time limit specified in Section 4.3 where applicable but in no event shall be made after the date when institution of legal or equitable proceedings based upon such claim, dispute or other matter in question, would be barred by the applicable statute of limitations. Unless otherwise agreed in writing by the Owner, Contractor shall carry on the Work and maintain its progress during any dispute with the Owner and the Owner shall continue to make payments, except as to any disputed amount, to the Contractor in accordance with the Contract Documents.

A new **Section 13.9** entitled "Prevailing Wage Rates", is added as follows:

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### **13.9 Prevailing Wage Rates**

#### **Section 13.9.1**

The Contractor shall pay no less than the prevailing wage rates, including contributions for employee benefits, as determined in the decision of the Secretary of Labor and Industry and shall comply with the provisions of the Pennsylvania Prevailing Wage Act, approved August 15, 1961, as amended (43 P. S. § 165-1 et seq.), and the regulations issued pursuant thereto. With respect to the wages to be paid, the Contractor shall comply with the requirements specified in the Commonwealth of Pennsylvania Department of Labor and Industry Prevailing Wage Determination and General Wage Decision #PA 02-1051

#### **Section 13.9.2**

The requirements of this Article shall apply to all Work performed on the Project by the Contractor, as well as all Work performed on the Contract by subcontractors and sub-subcontractors. Contractors shall insert the stipulations required in this Article in all its contracts with subcontractors.

#### **Section 13.9.3**

No workers shall be employed on the Project except in accordance with the classification set forth in the decision of the Secretary referenced in Section 13.9.1. A schedule of prevailing wage rates is included in the Specifications.

#### **Section 13.9.4**

All workers employed or working on the Project regardless of whether any contractual relationship exists or the nature of any contractual relationship which may be alleged to exist between any contractor, subcontractor and workers, shall, not less than once a week, be paid the full amount due at the time of payment, computed at the rate applicable to the time worked in the appropriate classification, without deduction or rebate on any account, either directly or indirectly, except authorized deductions.

#### **Section 13.9.5**

For the entire period of construction, the Contractor and each subcontractor shall post the wage determination decisions of the Secretary of Labor, including the effective date of any changes thereof, in a prominent and easily accessible place or places at the Work site, and at the place or places used by the Contractor and subcontractors to pay workers their wages. This notice of wage rates shall contain the following information: (a) name of the project; (b) name of public body for which it is constructed; (c) the crafts and classifications of workers listed in the Secretary's General Prevailing Minimum Wage Determination for the project; (d) the general prevailing minimum wage rates determined for each craft and classification and the effective date of any changes; and (e) a statement advising workers that if they have been paid less than the general prevailing minimum wage rate for their job classification or that the Contractor or subcontractor are not complying with regulations of the Secretary of Labor and Industry in any manner whatsoever, that they may file a protest in writing with the Secretary of Labor and Industry within three (3) months of the date of the occurrence, objecting to the payment to any Contractor to the extent of the amount or amounts due or to become due to them for any wages for Work performed on the Project. The notice shall also state that the workers will have a civil right of action for any rate which is paid which is less than that specified in the Contract, which right of action must be exercised within six (6) months of the occurrence of the event creating such right.

#### **Section 13.9.6**

Apprentices shall be limited to such numbers as shall be in accordance with a bona fide apprenticeship program registered with and approved by the Pennsylvania Apprenticeship and Training Council. Only apprentices whose training and employment are in full compliance with the provisions of the Apprenticeship and Training Act, approved July 14, 1961, and the rules and regulations issued pursuant thereto, shall be employed on this Project.

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**Section 13.9.7**

Payment of compensation to workers for work performed on this Project on a lump sum basis or a piece work system, or a price certain for the completion of a certain amount of work, or the production of a certain result shall be a violation of the Prevailing Wage Act and the regulations issued pursuant thereto, regardless of the average hourly earnings resulting therefrom.

**Section 13.9.8**

Failure to pay the wage rates specified herein shall, in addition to the other penalties provided in the Prevailing Wage Act, make the Contractor liable to the Owner for a penalty in an amount equal to the difference between the wages specified in the Contract and the wages actually paid to the laborer or employee.

**Section 13.9.9**

All such penalties withheld and deducted for use of the Owner from any monies due the Contractor shall be returned to the Contractor, if any such Contractor or subcontractor subsequently pays to all laborers and employees the balance of the amounts stipulated in the Contract.

**Section 13.9.10**

Every Contractor and subcontractor shall keep an accurate record showing the name, craft and the actual hourly rate of wage paid to each of the workers and such record shall be preserved for two (2) years of payment. The record shall be open at all reasonable hours to the inspection of the Owner, the Architect and the office of the Secretary of the Department of Labor and Industry.

**Section 13.9.11**

On a monthly basis, and before progress or final payments are made of any sums due on the Project, the Contractor and subcontractors shall file statements with the Owner or its designee, in a form satisfactory to the Secretary of the Department of Labor and Industry, certifying to the amounts then due and owing from such Contractor and subcontractors, to any and all workers for wages due on account of Work, setting forth therein the names of the persons whose wages are unpaid and the amount due to each respectively. This statement shall be verified by the oath of the Contractor and subcontractors, as the case may be, that he has read such statement subscribed by him, knows the contents thereof and that the same is true to the best of his own knowledge. Nothing contained herein shall impair the right of a Contractor to receive final payment because of the failure of any subcontractor to comply with the provisions of the Prevailing Wage Act.

A new **Section 13.10** entitled "School Code" is added as follows:

**13.10 School Code**

**Section 13.10.1**

All Contract Documents will be entered into under and subject to the provisions of the Act of Assembly of the Commonwealth of Pennsylvania, Act #442 effective February 1, 1962, as amended by Act #342, approved August 9, 1963 and in accordance with the provisions of the Public School Code of 1949, P.L. 30, its amendments and supplements, and regulations of the Department of Education. The successful Bidders agree to satisfy the Board concerning all of the requirements of the laws of the Commonwealth of Pennsylvania governing bidders and contractors on contracts with a school district.

**Section 13.11.1.2** Nondiscrimination Clause - During the term of this Contract, Contractor agrees as follows:

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

**Section 13.11.1.3**

Contractor shall in advertisements or requests for employment 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.

**Section 13.11.1.4**

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 worker's representative of its commitment to this nondiscrimination clause. Similar notice shall be sent to every other source or recruitment regularly utilized by the Contractor.

**Section 13.11.1.5**

It shall be no defense to a finding of noncompliance with Contract Compliance Regulations issued by the Pennsylvania Human Relations Commission or this nondiscrimination clause that the Contractor had delegated some of its employment practices to any union, training program or other source of recruitment which prevents it from meeting its obligations. However, if the evidence indicates that the Contractor was not on notice of the third-party discrimination or made full faith effort to correct it, such factor shall be considered in mitigation in determining appropriate sanctions.

**Section 13.11.1.6**

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 Human Relations Commission or this nondiscrimination clause, Contractor shall then employ and fill vacancies through other nondiscriminatory employment procedures.

**Section 13.11.1.7**

Contractor shall comply with the Contract Compliance Regulations of the Pennsylvania Human Relations Commission, 16 Pa. Code Chapter 49, and with all laws prohibiting discrimination in hiring or employment opportunities. In the event of the Contractor's noncompliance with the nondiscrimination clause of this Contract or with any such laws, this Contract may, after hearing and adjunction, be terminated or suspended in whole or in part, and the Contractor may be declared temporarily ineligible for further contracts with Owner, and such other sanctions may be imposed and remedies invoked as provided by the Contract Compliance Regulations.

**Section 13.11.1.8**

The Contractor shall furnish all necessary employment documents and records to, and permit access to its books, records and accounts by, the Owner and Human Relations Commission, for purposes of determining compliance with the Contract Compliance Regulations. If the Contractor does not possess documents or records reflecting the necessary information requested, it shall furnish such information on reporting forms supplied by the Owner or the Commission.

**Section 13.11.1.9**

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Contractor shall actively recruit minority subcontractors or subcontractors with minority representation among their employees.

**Section 13.11.1.10**

Contractor shall include the provisions of this nondiscrimination clause in every subcontract, so that such provisions will be binding upon each subcontractor.

**Section 13.12** is added as follows:

No Work shall be performed by the Contractor, any subcontractor or sub-subcontractor inside Owner's buildings unless Owner's personnel are present in the buildings at the time.

**ARTICLE 14 - TERMINATION OF THE CONTRACT**

**Sections 14.1.1, 14.1.2 and 14.1.3** are deleted in their entireties and the following **Section 14.1.1** is substituted therefor:

If the Work is stopped for a period of sixty (60) days under any order of any court, or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a subcontractor or their agents, or employees or any other persons performing any Work under the Contract with the Contractor, then the Contractor may, upon seven (7) additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner for all Work executed. No other compensation shall be awarded except as Owner in its sole discretion may determine appropriate.

**Section 14.2.1.5** is added as follows:

If the Contractor files a petition in bankruptcy, is adjudged bankrupt or if he makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of his insolvency, subject to all requirements and stipulations of the 1979 Federal Bankruptcy Law, as amended.

**END OF SUPPLEMENTARY GENERAL CONDITIONS**

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SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Ceramic and Porcelain tile for:
    - a. Walls.
  - 2. Metal edge strips.

1.2 PERFORMANCE REQUIREMENTS

- A. Dynamic Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ANSI A137.1 by Dynamic Coefficient of Friction (DCOF) AcuTest:
  - 1. Level Surfaces: Minimum 0.42.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
  - 3. Full-size units of each type of trim and accessory for each color and finish required.
  - 4. Metal edge strips in 6-inch lengths.

1.4 INFORMATIONAL SUBMITTALS

- A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- B. Product Certificates: For each type of product, signed by product manufacturer.
- C. Material Test Reports: For each tile-setting and -grouting product.



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1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
  - 1. Joint sealants.
  - 2. Metal edge strips.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup of each type of wall tile installation.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

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- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
  - 2. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
  - 1. Large Format Tile: Comply with ANSI A 118.5 series for tile installation standards.
    - a. Back buttering the tile to obtain 100 percent mortar coverage.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
  - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.
- F. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide manufacturer's shapes as selected.

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## 2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide product as specified or comparable product by one of the following:
  - 1. Daltile; Division of Dal-Tile International Inc. as basis of design.
  - 2. American Olean; Division of Dal-Tile International Inc.
  - 3. Crossville, Inc.

## 2.3 TILE PRODUCTS, T-1, T-2, T-2B, T3, T-4, T-5, T6, T-7, T-8, T-9

- A. Ceramic and Porcelain Tile: ANSI A137.1, in sizes and thickness as indicated on Drawings.
  - 1. Basis of Design Products: See Finish Schedule on Drawings.

## 2.4 TILE BACKING PANELS

- A. Type as specified in Section 092900 "Gypsum Board."

## 2.5 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set-Small Format Tile 12 inches or less in any direction): ANSI A118.4.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
    - a. Custom Building Products; Versa Bond.
    - b. Laticrete International, Inc.; 253 Gold Thinset Set Mortar.
    - c. MAPEI Corporation; UltraFlex 2 Thin Set.
    - d. Merkrete Inc.; 7D10 Latex Thin Set Mortar.
  - 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Latex-Portland Cement Mortar (Medium Bed/LHT Thin Set-Large Format Tile Mortar 12 inches or greater in any direction): ANSI A118.4 and ANSI A118.15.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Custom Building Products; ProLite.
    - b. Laticrete International, Inc.; 4 XLT.
    - c. MAPEI Corporation; UltraFlex LFT.
    - d. Merkrete Inc.; 820 Merlite.
- C. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :
    - a. Custom Building Products.
    - b. Laticrete International, Inc.
    - c. MAPEI Corporation.
    - d. Merkrete Inc.; Pro Epoxy Grout.

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2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

## 2.6 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.
  1. Manufacturers: Subject to compliance with requirements, provide products as indicated on Finish Schedule or comparable product by one of the following :
    - a. Custom Building Products.
    - b. Laticrete International, Inc.
    - c. MAPEI Corporation.
    - d. Merkrete Inc..
- B. Grout Color: See Finish Schedule.

## 2.7 ELASTOMERIC SEALANTS

- A. As specified in Section 079200 "Joint Sealants."
  1. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

## 2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications.
  1. Basis of Design Product: See Finish Schedule
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Grout manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout or tile.

## 2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.

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- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work as specified in Section 090511 "Concrete Floor Preparation."
  - 1. Proceed with application only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Concrete Substrates:
  - 1. Prepare substrate according Section 090511 "Concrete Floor Preparation."
  - 2. Concrete Testing: As specified in Section 090512 "Concrete Floor Moisture Content and pH Testing."
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

#### 3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
    - b. Tile floors composed of tiles 8 by 8 inches or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

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- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated *or recommended by manufacturer*, install tile with the following joint widths:
  - 1. Ceramic Tile: 1/16 inch.
  - 2. Porcelain Tile: 1/16 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- H. Metal Edge Strips: Install at locations indicated.
- I. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

### 3.4 TILE BACKING PANEL INSTALLATION

- A. Comply with Section 092900 "Gypsum Board."

### 3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove epoxy grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended

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by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

### 3.6 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Metal Studs or Furring:
  1. Tile Installation W243: Thin-set mortar on gypsum board; TCNA W243.
    - a. Thin-Set Mortar: Latex- portland cement mortar.
    - b. Grout: High performance cement unsanded grout.
  2. Tile Installation W244C: Thin-set mortar on cementitious backer units; TCNA W244.
    - a. Thin-Set Mortar: Latex- portland cement mortar.
    - b. Grout: High performance cement unsanded grout.

END OF SECTION

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SECTION 096623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Thin-set, epoxy-resin terrazzo flooring and base.
  - 2. Precast epoxy-resin terrazzo units.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
  - 1. Divider strips.
  - 2. Control-joint strips.
  - 3. Abrasive strips.
  - 4. Terrazzo patterns.
- C. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare Samples of same thickness and from same material to be used for the Work, in size indicated below:
  - 1. Terrazzo: 6-inch- square Samples.
  - 2. Accessories: 6-inch- long Samples of each exposed strip item required.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type of terrazzo material or product, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For terrazzo to include in maintenance manuals.



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1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Engage an installer who is a contractor member of NTMA.
- B. Source Limitations: Obtain primary terrazzo materials from single source from single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from single source with resources to provide materials of consistent quality in appearance and physical properties.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups for terrazzo including accessories.
    - a. Size: Minimum 100 sq. ft. of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.
- B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.
- C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

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- E. Control and collect water and dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

### 2.2 EPOXY-RESIN TERRAZZO

- A. Epoxy-Resin Terrazzo: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
  - 1. Products: Subject to compliance with requirements, provide product as indicated on Finish Schedule on Drawings or comparable one from of the following:
    - a. Terrazzo & Marble Supply Companies; Terroxy Resin Systems.
    - b. Crossfield Products Corp., Dex-O-Tex Division; Cheminert.
    - c. General Polymers; Sherwin Williams; Terrazzo 1100.
    - d. Key Resin Company; Key Epoxy Terrazzo.
    - e. Master Terrazzo Technologies LLC; Morricite.
    - f. Quadrant Chemical Corporation; Quadset Epoxy Terrazzo.
    - g. TEC Specialty; H.B. Fuller Construction Products Inc; Tuff-Lite Epoxy Terrazzo.
  - 2. Thickness: **3/8" nominal**.
  - 3. Formulated Mix Color and Pattern: See Finish Schedule.
- B. Materials:
  - 1. Flexible Reinforcing Membrane: Manufacturer's resinous membrane for substrate-crack preparation and reflective-crack reduction.
    - a. Reinforcement: Fiberglass scrim.
  - 2. Primer: Manufacturer's product recommended for substrate and use indicated.
  - 3. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated and in color required for mix indicated.
    - a. For Epoxy Matrix blended with three volumes of Valders marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to Installation Specifications, finishing to a nominal 3/8" (9.5 mm) thickness. All specimens cured for 7 days at 73-77°F (22.8-25°C) and 50 percent RH plus or minus 2 percent RH.
  - 4. Aggregates: Comply with NTMA gradation standards for mix indicated and contain no deleterious or foreign matter.
    - a. Abrasion and Impact Resistance: Less than 40 percent loss per ASTM C 131.
    - b. 24-Hour Absorption Rate: Less than 0.75 percent.
    - c. Dust Content: Less than 1.0 percent by weight.
  - 5. Finishing Grout: Epoxy Matrix or Clear Resin with a broadcast of limestone filler as recommended by manufacturer..

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### 2.3 PRECAST EPOXY-RESIN TERRAZZO

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products as indicated on Finish Schedule on Drawings or comparable product by one of the following:
  - 1. Precast Terrazzo Enterprises, Inc.
  - 2. Romoco Precast Terrazzo Products.
- B. Precast Terrazzo Units: Comply with NTMA's written recommendations for fabricating precast terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. Finish exposed-to-view edges and reveals to match face finish. Ease exposed edges to 1/8-inch radius.
  - 1. Precast Terrazzo Base Units: **3/8 inches** thick, cast in maximum lengths possible, but not less than 36 inches.
    - a. Type: Square
    - b. Height: 4 inches.
    - c. Outside Corner Units: With finished returned edges at outside corner.
  - 2. Precast Terrazzo Stair Treads: Thickness indicated with cast-in nosing.
    - a. Tread/Riser: 1/2 inch thick epoxy, with abrasive strips.
  - 3. Color, Pattern, and Finish: As indicated on Finish Schedule on Drawings.

### 2.4 STRIP MATERIALS

- A. Thin-Set Divider Strips: L-type angle, 3/8 inch deep.
  - 1. Material: Aluminum.
  - 2. Top Width: 1/8 inch .
- B. Top-Section Width: As indicated
- C. Control-Joint Strips: Separate, double L-type angles, positioned back to back, that match material and color of divider strips and in depth required for topping thickness indicated.
- D. Abrasive Strips: Three-line abrasive inserts at nosings, unless otherwise indicated. Silicon carbide or aluminum oxide, or combination of both, in epoxy-resin binder and set in channel.
  - 1. Width: 1/2 inch.
  - 2. Depth: As required by terrazzo thickness.
  - 3. Length: As indicated.
  - 4. Color: Match Architect's sample.
- E. Reducer Strip: Provide Schluter Reno-U as indicated on Drawings.

### 2.5 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use.

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- B. Crack Reduction Flexible Reinforcing Membrane:
  - 1. Basis of Design: Iso-Crack Epoxy Membrane or approved comparable product,
- C. Anchoring Devices:
  - 1. Precast Terrazzo: Provide mechanical anchoring devices as recommended by fabricator for proper anchorage and support of units for conditions of installation and support.
- D. Patching and Fill Material: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- E. Joint Compound: Terrazzo manufacturer's resinous product approved and recommended by manufacturer for application indicated.
- F. Resinous Matrix Terrazzo Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.
- G. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral; does not affect terrazzo color or physical properties; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.
  - 1. Surface Friction: Not less than 0.6 according to ASTM D 2047.
  - 2. Acid-Base Properties: With pH factor between 7 and 10.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
  - 1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.

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- b. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
  - c. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
  - 1. Moisture Testing: Perform tests indicated below.
    - a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      - 1) Perform tests so that each test area does not exceed 200 sq. ft., and perform not less than two tests in each installation area and with test areas evenly spaced in installation areas.
    - b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.
    - c. Test Method: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
- D. Protect other work from water and dust generated by grinding operations. Control water and dust to comply with environmental protection regulations.
  - 1. Erect and maintain temporary enclosures and other suitable methods to limit water damage and dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

### 3.3 EPOXY-RESIN TERRAZZO INSTALLATION

- A. Comply with NTMA's written recommendations for terrazzo and accessory installation.
- B. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to manufacturer's written instructions and NTMA's "Terrazzo Specifications and Design Guide."
- C. Installation Tolerance: Limit variation in terrazzo surface from level to 1/4 inch in 10 feet; noncumulative.
- D. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
- E. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.
- F. Flexible Reinforcing Membrane:
  - 1. Prepare and prefill substrate cracks with membrane material.
  - 2. Install membrane in areas to receive terrazzo.
  - 3. Reinforce membrane with fiberglass scrim.

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4. Prepare membrane according to manufacturer's written instructions before applying substrate primer.

G. Primer: Apply to terrazzo substrates according to manufacturer's written instructions.

H. Strip Materials:

1. Divider and Control-Joint Strips:
  - a. Locate divider strips in locations indicated.
  - b. Install control-joint strips in locations indicated.
  - c. Install control-joint strips with 1/4-inch gap between strips, and install sealant in gap.
  - d. Install strips in adhesive setting bed without voids below strips, or mechanically anchor strips as required to attach strips to substrate, as recommended by strip manufacturer.
2. Accessory Strips: Install as required to provide a complete installation.
3. Abrasive Strips: Install with surface of abrasive strip positioned 1/16 inch higher than terrazzo surface.

### 3.4 PRECAST TERRAZZO INSTALLATION

- A. Install precast terrazzo units using method recommended by NTMA and manufacturer unless otherwise indicated.
- B. Do not install units that are chipped, cracked, discolored, or not properly finished.
- C. Seal joints between units with joint compound matching precast terrazzo matrix unless otherwise indicated.

### 3.5 REPAIR

- A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

### 3.6 CLEANING AND PROTECTION

- A. Cleaning:
  1. Remove grinding dust from installation and adjacent areas.
  2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow them to dry thoroughly.
- B. Sealing:
  1. Seal surfaces according to NTMA's written recommendations.

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2. Apply sealer according to sealer manufacturer's written instructions.
- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION

## SECTION 107516 - GROUND-SET FLAGPOLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes ground-set flagpoles made from aluminum.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Delegated Design Submittals: For flagpoles.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.
- B. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads indicated within limits and under conditions indicated.
  - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 110 MPH.



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## 2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).
  - 1. Basis of Design Product: ***Acme Lingo, Moedel #E25056 External Halyard***
- B. Exposed Height: ***25 feet***
- C. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch (1.52-mm) wall thickness with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
- D. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

## 2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
  - 1. 0.063-inch (1.6-mm) spun aluminum with gold anodic finish.
- B. ***External Halyard System: braided polypropylene halyard; double sheave revolving truck assembly with plastic-coated counterweight and sling. Finish truck assembly to match flagpole.***

## 2.5 MISCELLANEOUS MATERIALS

- A. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- B. Sand: ASTM C33/C33M, fine aggregate.
- C. Elastomeric Joint Sealant: joint sealant complying with requirements in Section 079200 "Joint Sealants."
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

## 2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- D. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.
- E. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.
- F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION

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SECTION 114000 - FOODSERVICE 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. Provide all material, labor, equipment and services required to execute and complete all items of work relating to the food service equipment, both existing and new, all as required to make the resulting facility a fully functional and reliable operating unit in accordance with this Specification. All food service equipment shall be furnished as specified, delivered prepaid, unloaded and uncrated, assembled with all components and accessories connected within the equipment, set-in-place in proper location as indicated on the drawings, leveled and fastened to the wall, ceiling or floor as required, left ready for final utility connections. The work shall include:
  - 1. To prevent extended warehousing of all food service equipment, no pre-ordering of equipment is permitted; schedule ordering of the equipment so that warehousing of the equipment shall not be required for longer than 60 days prior to delivery to the site for installation.
  - 2. All food service equipment shall have a manufacturer extended warranty covering parts and labor for a period of two years which shall take effect only after acceptance and beneficial use by the District. All labor shall be performed by a factory authorized and qualified representative.
  - 3. A "complete and thorough" demonstration and start-up for each item of equipment must be conducted by a qualified manufacturer representative in the use, sanitation and maintenance of the equipment.
- B. Furnishing scheduled items of custom fabricated food service equipment as specified utilizing a food service equipment fabricator listed with the National Sanitation Foundation (NSF) for custom equipment fabrication.
- C. Delivery of food service equipment in factory fabricated containers designed to protect equipment and finish until final installation. Delivery of food service equipment shall be coordinated with the construction schedule. If necessary, delivery of the food service equipment shall be by means other than common carrier to expedite delivery and to maintain project schedule.
- D. Warehousing of the food service equipment in a bonded warehouse and re-delivery of the food service equipment from the storage facility to the project site or arrangement for secured storage at the project site to assure availability of the food service equipment to maintain project schedule.

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- E. Field installation of the food service equipment including buy out equipment at the project site including on site receiving and unloading, uncrating from packing containers, conveyance of the food service equipment from the receiving area to the installation location, erection and assembly of the food service equipment including field welding and polishing of sub assemblies and installation of fixtures and components and setting in place in final location.
- F. Removal and disposal of discontinued items of food service equipment not to be reused including costs for transport and scrapping. This shall include pump-down and reclaim of refrigerant and fire system propellant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- G. Removal and disposal of discontinued items of food service equipment not to be reused including costs for transport and scrapping. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- H. Removal, cleaning, servicing, reassemble and reinstallation of items of food service equipment to be reused including warehousing and transportation costs for scheduled items of food service equipment to be refurbished off-site or to be temporarily stored off-site. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of discontinued services and modification or preparation or relocated utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- I. Removal, cleaning, servicing, crating and delivery including costs for transport of items of food service equipment to be reused in an alternate location. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- J. Removal and disposal of all packing material.
- K. All costs for special tools, crane rental or usage cost or rigging as may be required for delivery or installation of the food service equipment.
- L. All work is to be performed by skilled labor utilizing the proper Trades having respective jurisdiction thereto. All work shall be performed at hours required to maintain consistent work schedules with all other Trades without additional cost.
- M. Preparation of dimensioned utility rough-in floor plans coordinated with the Contract Documents and site conditions and the food service equipment manufacturers' utility connection points for all food service equipment.
- N. Assist in the preparation of "chalk-line" mark-up of utility rough-in locations on the building floor at the job site.

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- O. Take complete financial responsibility for any and all additional expenses resulting from incomplete or inaccurate rough-in drawings or instructions for the final rough-in dimensioning at the job site.
- P. Provide complete manufacturers' and fabricator shop drawings of all related items of food service equipment.
- Q. Provide competent on-site supervision for the coordination of work and to assist and supervise the erection, assembly and installation of the food service equipment, this shall include any moving, shifting or disassembly of the food service equipment to enable work to be performed free of obstruction.
- R. Attend all job conferences and meetings.
- S. Maintaining coordination and control over the form, fit, function and utility requirements of all food service equipment, from placement of purchase orders through Final Acceptance.
- T. Provide competent on-site final testing, demonstration and instruction in the use and service of all items of food service equipment in the form of a qualified manufacturer's representative for each item of food service equipment.
- U. Providing access to the custom equipment fabricator's shop for inspection of construction and materials used at any time during the progress of fabrication.
- V. Field verification of all measurements at the project site prior to the fabrication of custom fabricated and buy-out equipment and correct any deviation from the dimensions indicated on any plans and shop drawing which may affect the final form or fit of any item of food service equipment as a result of final building conditions and actual field dimensions.
- W. All food service equipment shall conform to field verified dimensions and to the finished building conditions with edges scribed and sealed to wall surfaces, fitting to and around building obstructions. All joints, seams or surfaces shall be fully sealed with General Electric or equivalent clear silicone sealer.
- X. Field verification of delivery access into and through the building to the final equipment location including access and clearance through hallways, doorways and elevators (cab size and weight restrictions); furnish food service equipment in sections or sub-assemblies as required for access.
- Y. Keeping the premise free from accumulation of waste material and rubbish caused by his work. At the completion of each workday all waste material and rubbish must be removed and all areas swept broom clean.
- Z. Physical damage to equipment, building or previous work completed or in the process of completion shall be repaired or replaced.
- AA. Furnish as part of and affixed to the food service equipment, accessories, components and fixtures furnished standard with the equipment as specified or listed as an option and shall include the following:

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1. **PLUMBING ACCESSORIES:** Pop-up, lever or basket type waste outlets, tailpieces, standing or connected overflows, faucets and spray units, vacuum breakers, shut-off and control valves and fittings.
  2. **STEAM AND GAS ACCESSORIES:** Steam supply valves, thermostats, pressure reducing and regulating valves, shut-off and control valves, temperature and pressure gauges, copper steam coils or injector assemblies, traps and fittings
  3. **ELECTRICAL ACCESSORIES:** Terminal blocks, conduit, wiring, signal and pilot lamps, on-off and control switches, control panels, magnetic contactor assemblies, heating elements, junction boxes, outlet boxes and receptacles and cord and plug sets.
  4. **REFRIGERATION ACCESSORIES:** Copper insulated refrigeration tubing, valves, fittings, hangers, high- and low-pressure control switches, solenoid valves, evaporator coils, expansion valves, condensing units and condensate evaporators.
- BB. All built-in accessories, components and fixtures shall be factory installed at the time of fabrication and shall comply with all applicable codes and regulations.
- CC. Furnish and install copper insulated refrigeration lines from compressor location to evaporator coils and expansion valves for all refrigeration units and ice makers with remote or refrigeration systems other than self-contained.
- DD. Furnish and install flexible stainless-steel gas flue tubing from exhaust collar on gas hot water booster heater terminating at the exhaust vent connection at the vent extension or condensate hood.
- EE. Furnish 14-gauge galvanized steel welded roof curbs for all refrigeration condensing unit stands and exhaust fans and supply fan make-up air units including setting-in-place and securing to the building roof.
- FF. Furnish and install in exhaust hood, plenum, duct and surface fire protection system. Entire system shall be furnished and installed in compliance with UL Standard 1254, UL Standard 300, NFPA 96 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17A-27. The manufacturer of the fire suppression system shall be ISO 9001 registered. The entire installation must conform to ADA (American Disabilities Act) latest edition. The system shall be an automatic fire suppression system using a wet chemical agent for grease related fires. The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories (UL). The system shall be installed and serviced by certified personnel trained by the manufacturer. Provide as part of fire system, mechanically operated gas supply line shut-off valve to interrupt gas supply to all gas operated cooking appliances. Gas valve shall be provided with manual reset to prevent gas flow to pilot devices on appliances prior to restart.
- GG. Furnish and install remote and self-contained refrigeration system complete with condensing unit and insulated copper refrigeration lines charged with R448A refrigerant. Condensing unit shall be interconnected to a low profile, high velocity evaporator coil. Refrigeration system shall include all fittings, valves, switches, controls and all related components to comprise a complete operating unit of sufficient BTU capacity to maintain automatic operation of 35-degree F product temperature in coolers and -10-degree F product temperature in freezers. Refrigeration system provided with outdoor remote air-cooled condensing unit shall be provided with winterized controls (low ambient package) including crankcase heater, line dryers and head

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pressure control unless specified as part of a pre-assembled refrigeration rack system. Refrigeration lines to be run within any slab or floor shall be either hard copper or soft copper if run within conduit.

- HH. All electrical wiring, plumbing lines, gas lines (except exposed threaded pipe gas manifolds at cooking appliances), steam lines and refrigeration lines shall be concealed in the floor, walls or above the finished ceiling in an acceptable manner and in compliance with all applicable codes. Where it is impractical to run lines within the floor, walls or above the finished ceiling, lines shall be enclosed in a stainless steel (or alternate "smooth and cleanable" approved material) with appropriate access for service or replacement. In situations of an island arrangement or where equipment is not situated with access to a wall surface, lines must be installed in the floor in an approved manner including in-ground conduit for refrigeration and beverage lines. In no case shall any lines be "exposed".
- II. Furnish materials and install all interconnecting wiring as required for the food service equipment, except for exhaust ventilation and fire suppression systems. This shall include inter-wiring of control panels furnished as a part of a fixture or appliance, on-off switches for light fixtures furnished as a part of a fixture or appliance, inter-wiring of control devices to motors furnished as a part of a fixture or appliance, time clock circuits for freezers from remote condensing unit to evaporator coil, heated pressure relief ports in walk-in freezer, electrical receptacles furnished as a part of a fixture or appliance, light fixtures in walk-in refrigeration to on-off switches and conduit junction boxes, ceiling mounted heat lamps to remote wall switch and inter-wiring of food waste disposer from control device to disposer motor as required to complete the installation of the food service equipment. This work does not pertain to the any of the exhaust and supply ventilation systems on the project.
- JJ. Furnish materials and install heat tracing tape to all condensate lines within walk-in freezer; insulate entire heat tracing tape with foam pipe insulation.
- KK. Furnish materials and install all interconnecting plumbing as required for the food service equipment, except for exhaust ventilation and fire suppression systems. This shall include faucets, drains, drains with connected overflow, shut-off valves, vacuum breakers, flow or pressure control valves, gauges, bleeder tubes, piping from disposer control device to disposer cone and disposer body inlets and piping for steam operated equipment from boiler take-off valve at steam generator to steam inlet connection at appliance as required to complete the installation of the food service equipment.
- LL. Furnish materials and install insulated copper interconnecting piping between the dishmachine and the hot water booster heater, this shall include the installation of pressure and temperature gauges, strainer and shock absorber in the hot water supply line to the booster heater.
- MM. Furnish and install water filter assemblies, sized and of the proper type to accommodate the water flow rate and "particulate" requirement of the food service equipment; this shall include all combi and bake ovens, steam cookers, proofing cabinets, ice makers, coffee brewing equipment and soda and beverage dispensing equipment.
- NN. Furnish and install copper condensate lines in walk-in refrigeration from evaporator coil to waste receptor.

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- OO. Furnish and install gas supply shut-off valve at each gas manifold connection and furnish and install flexible gas hose connectors to each shut-off valve and to each cooking appliance.
- PP. Furnish materials and install interconnecting chrome plated exposed piping for hose reel and hose bibs including installation of check valves and vacuum breaker in supply line; this shall include chrome plated bleeder outlet if required by local health department regulations or local plumbing codes.

### 1.3 WORK BY THE ELECTRICAL TRADE

- A. Rough-in utility connections including proper voltage, phase and amperage required to satisfactorily operate all items of food service equipment.
- B. Final connection of the food service equipment from the rough-in location to the connection point on all food service equipment and necessary connection points.
- C. All electrical components for the exhaust and supply ventilation system (including condensate hoods and pant leg vent systems) including, electrical disconnects, starters, exhaust fan on-off switch with indicator lights located in kitchen and supply fan controller with indicator lights located in kitchen and dishroom.
- D. Furnishing and installation of all accessories, components and fixtures other than those specified as part of the food service equipment, to include but not be limited to, electrical circuit breakers or fuses, electrical receptacles, disconnect switches, on-off switches or other fittings and appurtenances that are required to connect the food service equipment in accordance with manufacturer's instructions and result in proper operation.
- E. Utility disconnection and termination of discontinued services of existing food service equipment to be terminated.
- F. Furnishing and installing electrical plug and cord sets where not furnished as part of the appliance.
- G. Electrical contractors or shunt-trip circuit breakers to interrupt electrical power to all electrically operated food service cooking appliances.
- H. In-floor, flush mounted, waterproof electrical receptacles of type and capacity to match plug and cord sets for all mobile food service counter equipment.
- I. Ceiling mounted, retractable drop cords to accommodate food service equipment in an island arrangement, of the type and capacity to match plug and cord sets of the food service appliances.
- J. Furnishing materials and installation of all interconnecting wiring as required for the food service exhaust ventilation and fire suppression systems; this shall include wiring of electrically operated gas supply shut-off valves for fire suppression systems, fire suppression system wiring to building fire alarm, heat detector electrical detection device to automatically start supply and exhaust fans and exhaust hood light fixtures to remote wall switch.



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#### 1.4 WORK BY THE PLUMBING TRADE

- A. Rough-in utility connections including gas, steam, hot and cold water and floor receptors and drains in proper sizes, pressures and quantities required to satisfactorily operate all items of food service equipment.
- B. Final connection of the food service equipment from the rough-in location to the connection point on all food service equipment and necessary outlets.
- C. Furnishing and installation of all accessories, components and fixtures other than those specified as part of the food service equipment, to include but not be limited to stop cocks, traps, pipe, shut-off valves, pressure reducing valves or other fittings and appurtenances that are required to connect the food service equipment in accordance with manufacturer's instructions and result in proper operation.
- D. Furnishing and installing chrome plated indirect waste outlet piping for food service equipment, from the waste outlet connection on the food service equipment to the building waste receptacle (floor sink, etc.).
- E. Flushing and sanitizing of lines before making final connections to the food service equipment.
- F. Grease interceptors for food service equipment in capacity and size as required by code.
- G. Furnish and install exposed threaded gas manifold piping for all cooking appliances and welded in-wall gas manifold piping.
- H. Install gas shut-off valve supplied as part of the fire suppression system in the gas supply line in an exposed and accessible location.

#### 1.5 WORK BY THE MECHANICAL TRADE

- A. Supply and exhaust ventilation for indoor refrigeration condensing units based on 750 cfm for each air-cooled compressor horsepower and 250 cfm for each water-cooled compressor horsepower.
- B. Exhaust ventilation for condensate applications including fully welded 18-gauge stainless steel or 12-gauge aluminum liquid tight ductwork pitched toward source to prevent leaking, fan and start-stop switch with indicator lights located in the dishroom.
- C. Exhaust hood exhaust ventilation system including roof top mounted "utility set" type up-blast centrifugal fan with backward incline wheel, adjustable sheaves, vibration mounts and bird screen at discharge end; fan shall be rated at 14 sones or less and shall be UL 710 listed; roof curb, exhaust ductwork constructed of a minimum 16 gauge galvanized steel or 18 gauge stainless steel, fully welded liquid tight with clean-outs at every major bend and in 20 foot intervals; ductwork shall not exceed a three to one aspect ratio, connection to exhaust fan shall include a UL listed and rated vibration eliminator and ductwork shall be insulated with all prevailing codes.

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- D. Exhaust hood supply ventilation system including roof top mounted UL listed supply fan with vibration mounts, adjustable sheaves, roof curb, bird screen at intake end, maintainable filtration system, and gas or electric heated supply air heater (supply air heater heat incoming supply air below a 65-degree F ambient temperature) and 22-gauge galvanized steel ductwork.
- E. Disconnection and termination of discontinued ductwork of existing exhaust or condensate hoods to be terminated or relocated, and modification or preparation of exhaust system for existing exhaust or condensate hoods to be relocated at the new location.

#### 1.6 WORK BY THE CONSTRUCTION TRADE

- A. Masonry bases, floor curbs, structural pads, floor depressions, roof curbs, flues and fireproof duct shafts or enclosures.
- B. Conduit for beverage lines (PVC if embedded in concrete or smooth aluminum if exposed) with 24" radius sweep bends and 24" x 24" pull boxes every 100 lineal feet or three turns including sleeves any through walls, floors and ceilings.
- C. Sleeves and openings through wall, floors and ceilings for passage of refrigeration lines.
- D. Wall blocking or reinforcing to adequately support wall mounted food service equipment or fixtures; provide 3/4" thick exterior grade plywood backing for wood stud applications and 16-gauge steel backing for metal stud applications.
- E. Stainless steel or FPR wall paneling behind all mop receptors, dishtables and pot / utensil washing sinks.
- F. Installation of floor pans in floor depression with floor pans set flush and finished watertight around entire perimeter at juncture with floor surface.
- G. Conduit for refrigeration lines (PVC if embedded in concrete or smooth aluminum if exposed) with 24" radius sweep bends including sleeves any through walls, floors and ceiling.

#### 1.7 WORK BY THE ROOFING TRADE

- A. Roof penetrations properly sealed and flashed to prevent water penetration.

#### 1.8 BIDDING INSTRUCTIONS AND QUALIFICATION OF BIDDER

- A. The primary items of food service equipment described in this specification are considered the basis of the bid. Only "equal" items listed as part of this specification will be considered and must meet the conditions of the base bid item; this shall include all materials and material finishes, fabrication methods, electrical, plumbing, and mechanical components, electrical control devices, hardware, accessories and options, exactly as specified without exception. It will be the full and complete responsibility of the Food Service Equipment Contractor to pay any and all costs incurred in adapting any other "equal" item to the mechanical, electrical, exhaust ventilation or

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structural systems of the building including any other cost increase incurred as a result of engineering changes to the mechanical, electrical, exhaust ventilation, architectural, structural or food service drawings. The contract is to be awarded as follows:

1. The competence and responsibility of the bidder.
  2. An itemized cost breakdown of each scheduled item of food service equipment is required, as specified, in order that the District may, at his option, delete any item or supply any portion thereof, or increase the quantity of any item without affecting the cost quoted for the remaining items. "Pre-approved" substituted items must be submitted as an add or deduct alternate in addition to the base bid.
  3. The District is not obligated to accept the lowest or any other bid. The award of the contract and choice of the food service equipment Contractor shall be at the District's discretion.
- B. Each bidder shall be responsible to visit the project site of the proposed work and fully acquaint himself with conditions as they exist.
- C. Each bidder is responsible to attend any pre-bid meeting as required by the District.
- D. Each bidder shall be responsible to examine and review the contract document drawings and specifications. Should the bidder find during examination of the drawings and specifications any discrepancies, omissions, ambiguities, or conflicts in or among the contract documents or shall be in doubt as to their meaning, the District shall be notified no later than four working days prior to bid opening for clarification.
- E. The failure or omission by any bidder to receive or examine any form, instrument or document or to visit the project site shall in no way relieve him from obligation with respect to his bid. No claims for any extras will be allowed due to unintentional errors, conflicts, or omissions in the contract documents drawings or specifications.

#### 1.9 SUBMITTALS

- A. Product Data: For each buy-out item of food service equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel and service connections including roughing-in dimensions
- B. Shop Drawings: For food service equipment not manufactured as standard production and catalog items by manufacturers. Shop drawings shall include the following information:
1. Dimensioned rough-in plans scaled at 1/4"=1'-0" accurately locating connection points and indicating utility data for all mechanical, electrical and supply and exhaust ventilation requirements.
  2. Dimensioned plans scaled at 1/2"=1'-0" accurately locating and indicating the finished size of masonry bases, floor depressions in structural slabs, stub walls, curbs and finished openings for pass-thru equipment.
  3. Dimensioned plans scaled at 1/4"=1'-0" accurately locating conduit and pull boxes for beverage and refrigeration lines including floor, wall and ceiling penetrations and termination points.

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4. Dimensioned plans and detailed drawings of all custom fabricated food service equipment scaled at 3/4"-1'-0" for plan and elevation views and 1-1/2"=1'-0" for sectional views.
- C. Copies of original maintenance and repair manuals including a list of all authorized service agencies responsible for each item of food service equipment.

#### 1.10 QUALITY ASSURANCE

- A. Manufacturer's qualifications shall include a firm that has regularly engaged in the manufacturing of food service equipment of the same type, capacity, performance and size as specified and whose products have been in similar service for not less than five years.
- B. Custom fabricator qualifications for custom food service equipment shall include a skilled sheet metal shop with a minimum of five years' experience in custom sheet metal food service equipment fabrication of similar type as specified. All custom food service equipment shall be fabricated at the same shop.
- C. Installer's qualifications shall include a firm with at least three years of successful installation experience on projects with a similar scope to that as required for this project.
- D. Food service equipment dealers' qualifications shall include a firm which is regularly engaged in the purchasing of food service equipment as is a manufacturer authorized agent of the specified equipment for not less than five years. The dealer shall also employ a full time project management staff to oversee the purchase of the equipment in compliance with the specifications, coordinate the form and fit of the equipment to the project site conditions, attend all project meetings, coordinate shop drawing review, coordinate installation with the Trades, coordinate factory training and address all issues as they relate to the satisfactory completion of the facility in compliance with the specifications and related documentation.
- E. Codes and Standards: All food service equipment furnished and installed under this specification shall be manufactured in strict compliance with the following publications or the current or revised related publication as well as all state, national and local codes and agencies having jurisdiction over same:
  1. National Electrical Manufacturer Association NEMA
    - a. ICS-77 Industrial Controls and Systems
  2. National Electrical Manufacturer Association NEMA
    - a. ICS-77 Industrial Controls and Systems
    - b. 17.4 Local Application System
    - c. 17.13 Water Sprinkler Systems
    - d. 96-76 Installation of Equipment for the Removal of Smoke and Grease Laden Vapors for Commercial Cooking Equipment
  3. National Sanitation Foundation NSF
    - a. 11 76 Food Service Equipment
    - b. 4 73 Commercial Cooking and Warming Equipment
    - c. C-2-72 Special Equipment and/or Devices
  4. National Electrical Manufacturer Association NEMA
    - a. 57-78 Electric Lighting Fixtures

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- b. 197-78 Commercial Electric Cooking Appliances
  - c. 300 Fire Extinguishing Systems
- F. All food service equipment shall be manufactured in strict compliance with standards as set forth by the National Sanitation Foundation (NSF) including fabrication of custom-built equipment and shall be listed with same and shall bear their seal. Any item of food service equipment lacking the NSF seal will be rejected.
- G. All electrically operated food service equipment shall be constructed in strict compliance with standards as set forth by the Underwriters Laboratories (UL) and shall utilize approved components and assemblies and shall bear the label thereof.
- H. Custom fabricated food service equipment shall be constructed to the standards as set forth by the National Association of Food Equipment Manufacturers (NAFEM).
- I. All refrigeration equipment and all pressurized vessels shall be constructed, approved, inspected, registered and stamped and installed in strict compliance with the American Society of Mechanical Engineers (ASME), state and local codes for Unfired Pressure Vessels and all other agencies having jurisdiction thereof.
- J. All gas operated food service equipment shall be fabricated in strict compliance with standards as set forth by the Underwriter Laboratory (UL) and shall be listed with same and shall bear their seal.
- K. Steam operated equipment shall be fabricated and installed in accordance with Pennsylvania Department of Labor and Industry standards.
- L. Product Options: Drawings indicate food service equipment based on the specific products indicated. Other manufacturers' equipment with equivalent size and performance characteristics may be considered.
- M. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to food service equipment including, but not limited to the following:
- 1. Review access requirements for equipment delivery.
  - 2. Review equipment storage and security requirements.
  - 3. Inspect and discuss condition of substrate and other preparatory work performed by other Trades.
  - 4. Review structural loading limitations.
  - 5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
- 1.11 DELIVERY, STORAGE AND HANDLING
- A. Deliver food service equipment as factory-assembled units with protective crating and covering.
  - B. Store food service equipment in original protective crating and covering and in a dry location.

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1.12 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of food service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.13 COORDINATION

- A. Coordinate equipment layout and installation with other work including light fixtures, HVAC equipment and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.
- C. Coordinate size, location and requirements of concrete bases, positive slopes to drains, floor depressions and insulated floors. Concrete, reinforcement and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete".
- D. Coordinate installation of roof curbs, equipment supports and roof penetrations, as specified in Division 7 Section "Roof Accessories".

1.14 WARRANTIES

- A. General Warranty: The special warranty specified in this Article shall not deprive the District of other rights the District may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. All buy-out food service equipment herein specified shall have all parts and labor warranted in writing, from the date of Final Acceptance by the District against defective parts, materials, workmanship and design for a period of time as stated within the manufacturers standard published warranty, but no less than two years.
- C. All custom fabricated food service equipment shall be warranted as stated above except for a period of two years.
- D. Refrigeration equipment shall include start-up and two-year parts and labor warranty on the entire refrigeration system and manufacturers five-year parts warranty on hermetic scroll and semi-hermetic sealed compressors.

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PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. Stainless steel shall be type 302 or type 304 extra low carbon non-magnetic austenitic 18% chrome, 8% nickel alloy steel. Gauges shall be U.S. Standard of Thickness set forth below:

GAUGE	THICKNESS	GAUGE	THICKNESS
10	.1346	16	.0598
11	.1196	18	.0478
12	.1046	20	.0359
14	.0747	22	.0299

- B. All sheets shall be of maximum length to permit fabrication from one sheet. All thickness must meet the above gauge thickness within tolerances set forth by the ANSI after polishing. Finished sheets exceeding these tolerances shall be rejected as not meeting this Specification.
- C. Galvanealed steel shall be ARMCO steel or an approved grade of copper bearing steel shall be properly primed, degreased and finished with two coats of synthetic aluminum bronze.
- D. Structural steel members used for framing, consisting of angles, bands, bars and channels shall be ductile in quality, free of hard spots, runs, checks, cracks and other surface defects and shall be smooth galvanized by the hot dip process with all surplus removed, free of runs, blisters, excess splatter and uncoated spots or patches.
- E. White metal shall consist of corrosion resistant metal containing not less than 21% nickel. All castings shall be rough ground, polished and buffed to a bright luster and shall be free from pit marks, runs, checks, burrs and other imperfections.
- F. Stainless steel pipe and tubing shall be seamless or welded of gauge specified and of true roundness. Seamless tubing shall be thoroughly and correctly annealed and ground smooth. Welded tubing shall be thoroughly heat treated and properly quenched to eliminate carbide precipitation, drawn true to size and roundness and polished to match stainless steel sheets.
- G. Welding shall be of the electric submerged or concealed arc type, heliarc wherever practical. Where welding rods are required they shall be of the same composition as materials to be joined coated with a non-carbonaceous flux.
- H. Plastic Laminate: Complying with NEMA LD 3 and NSF 35 requirements; NSF certified for end-use application indicated; 0.050 inch (1.27 mm) thick, smooth texture and easily cleanable.
1. Color: As selected by Architect from manufacturer's full range of colors.
  - I. Plywood and Lumber: Close grain exterior grade mahogany or birch plywood.

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- J. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that when cured and washed meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.
  - 2. Backer Rod: Closed-cell polyethylene in diameter larger than joint width.
- K. Plastic: Except for plastic laminate, provide plastic materials and components complying with NSF 51.
- L. Sound Dampening: NSF-certified, non-absorbent, hard drying, sound-deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8-inch (3-mm) thickness that does not chip, flake or blister.
- M. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene or PVC that is nontoxic, stable, odorless, nonabsorbent and unaffected by exposure to foods and cleaning compounds.

## 2.2 ACCESSORIES

- A. Cabinet Hardware: Provide NSF-certified stainless-steel hardware for equipment items as indicated.
- B. Casters: NSF-certified standard-duty stainless-steel swivel stem casters with 5-inch (125-mm) diameter wheels, polyurethane tires with 1-inch (25-mm) tread width and 300-lb (90-kg) load capacity per caster. Provide brakes on 2 casters per unit.

## 2.3 FABRICATION, GENERAL

- A. All welds shall be strong and ductile, nonporous, free of pits and cracks. Parts which are to be welded shall be homogeneous, of a like color and finish to adjoining material. Excess metal and carbide precipitation shall be ground off, finished smooth and polished. Unexposed welds shall be pacified to prevent attrition. Brazed or soldered joints are unacceptable. Where galvanizing has been damaged due to the welding or grinding process, these areas shall be galvawelded to replace finish
- B. All exposed surfaces of the food service equipment shall be free from bolts, screws and rivet fastenings. Wherever bolts are required they shall be of similar composition and finish as the metal to which they are applied.
- C. Wherever practical all food service equipment and fixtures shall be factory or shop fabricated of one-piece construction, shipped to the project site as one unit completely assembled.
- D. Items of food service equipment or fixtures too large to enter or transverse the building to the installation location in one assembly shall be constructed in sections and shall be furnished with field joints. Where field joints are necessary, all adjoining exposed surfaces shall be field welded



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at the project site as specified above for welding. Where conditions make welded field joints impractical, each sub-assembly shall be fabricated with off-set draw angles welded to the underside of each adjoining top surface and drawn together to a "hairline" seam with 1/4"-20 stainless steel bolts with lock washers and chrome plated acorn nuts. Bolted field joints will be permitted only where specifically shown on Drawings or specified for a particular item.

- E. Wherever shear edges occur they shall be free of burrs, fins or irregular projections and shall be finished to prevent cutting or laceration when the hand is drawn over such shear edges. Brake bends shall be free of undue and where such bends do mar the uniform surface appearance of the material, such marks shall be removed by suitable grinding, polishing and finishing. In no case where miters or bullnose corners occur is overlapping materials acceptable.

## 2.4 GENERAL FRABRICATION STANDARDS

### A. TOPS:

1. Tops shall be fabricated of 14-gauge stainless steel unless otherwise specified. All edges shall be bullnose or formed as specified with all joints butt-edged and electrically welded, ground smooth and polished so no evidence of welding will appear. Soldered corners to achieve round corner construction will not be accepted.
2. Tops adjacent to walls, columns or other equipment shall be turned up integrally into a backsplash as specified. All interior corners shall be coved on a  $\frac{3}{4}$ " radius, both horizontally and vertically, forming spherical corners. Ends of backsplashes shall be fully enclosed to the low point of the top edge, fully welded, ground smooth and polished.

### B. SUPPORT FRAMING

1. Around the entire perimeter on the underside of all tops and set back 1" from the down-turned edge shall be a fully welded frame assembly fabricated of 1-1/2" x 1-1/2" x 1/8" stainless steel angle iron or material as specified. Provide intermediate cross bracing fabricated of the same material as the angle framing and fully weld to perimeter frame on centers not to exceed 24". Tack weld the entire frame assembly to the underside of the top surface.
2. Open base tables shall be provided with leg mounting channels for weld anchoring leg gussets and shall be fabricated of 1" x 4" x 1" 12-gauge stainless steel or material as specified fully welded at each end of frame and at intervals not to exceed 6'-0".
3. Cabinet base tables and counters shall be provided with triangular corner gusset plates for weld anchoring counter type legs and shall be fabricated of 12-gauge stainless steel fully welded at each corner of table or counter body and at intervals not to exceed 6'-0".
4. Freestanding sinks and Bain Maries shall be provided with triangular corner gusset plates for weld anchoring leg gussets and shall be fabricated of 12-gauge stainless steel, fully welded at each corner of sink or Bain Marie bottom and at intervals not to exceed 6'-0".

### C. LEGS AND ADJUSTABLE BULLET FEET

1. Legs shall be constructed of 1-5/8" diameter 16-gauge stainless steel tubing. Each leg shall be swaged and tapered at the bottom. Fasten each leg to a 3-1/2" high conical shaped die-formed stainless steel gusset equivalent to Component Hardware A20-0206. Provide

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each leg with stainless steel adjustable foot insert equivalent to Component Hardware A10-0852.

2. Cabinet base tables and counters shall be provided with 6" high conical shaped die-formed stainless steel equipment leg with stainless steel adjustable round foot insert equivalent to Component Hardware A72-0811.

D. CROSSRAILS

1. Provide all open base tables and freestanding sinks and bain Maries with 1-1/4" diameter 16-gauge stainless steel tubular cross railing running between legs at a point 10" above the finished floor. Cross railing shall be continuously welded to legs, filleted, ground smooth and polished to provide a smooth coved radius with leg surface.
2. Where cross railing abuts cabinet base fixtures, cross railing shall be concealed bolt anchored to same utilizing stainless-steel hardware.

E. UNDERSHELVES

1. Provide solid fixed undershelf, constructed of 16-gauge stainless steel. Front edge shall be turned down 1" at 90 degrees and returned 1/2" at 45 degrees. Rear and ends shall be turned up 2" high on a 90-degree angle, interior corners coved on 3/4" radius.

F. DRAWERS

1. Provide drawer pan constructed of 14-gauge stainless steel with inside corners coved on a 3/4" radius. Drawer front face shall be double pan type constructed of 16-gauge stainless steel with inner pan set into outer pan and welded in place. Drawer front shall be set into and shall be removable from a 14-gauge stainless steel, channel shaped drawer cradle. Drawer suspension slides shall be secured to drawer frame assembly and shall be Component Hardware S52 series full extension type with 14-gauge stainless steel slides with stainless steel ball bearing wheels having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Drawer suspension guides shall be fastened to 18-gauge stainless steel housing which is suspended from the angle framing under the table top. Provide drawer fronts with full grip recessed stainless steel flush pull handles.
2. Stainless steel drawer enclosure cabinet with quantity of drawers as specified with cabinet body fabricated of 18-gauge stainless steel, wrap around construction. The backs of front stiles shall be closed with tight fitting channel sections of 18-gauge stainless steel, welded in place, and closed on top and bottom. Drawer suspension slides shall be secured to drawer frame assembly and shall be Component Hardware S52 series full extension type with 14-gauge stainless steel slides with stainless steel ball bearing wheels having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Provide drawer fronts with full grip recessed stainless steel flush pull handles.

G. CABINET BASES

1. Cabinet body shall be fabricated of 18-gauge stainless steel wrap around construction. The backs of front stiles shall be closed with tight fitting channel sections of 18-gauge stainless steel, welded in place and closed on top and bottom.
2. Cabinet base shelves shall be fixed bottom and intermediate fabricated of 18-gauge stainless steel. Front edge shall be turned down 1 1/2" at 90 degrees, returned 1/2" at 90

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degrees. Rear and ends shall be turned up 2" at 90 degrees with interior corners coved on a  $\frac{3}{4}$ " radius. Shelf shall be weld anchored to cabinet body. Bottom shelf shall be fabricated flush with front mullions with fully welded facing junctures presenting seamless construction. Fixed intermediate shelves shall be designed similar to bottom shelf except front edge shall be set behind vertical mullions and fully welded thereto.

H. SLIDING DOORS

1. Sliding doors shall be double pan type constructed of 16-gauge stainless steel with inner pan set into outer pan and welded in place. Doors shall have welded internally 1" x 4" x 1" 14-gauge stainless steel hat type reinforcing channels. Doors shall be fitted with full grip, recessed type stainless steel flush pull handles. Provide 16-gauge stainless steel angle door stops welded to door. Provide hard rubber door stops. Provide each door with two, 1  $\frac{3}{8}$ " diameter stainless steel ball bearing sheaves fastened to 1" x  $\frac{1}{8}$ " thick stainless-steel bar stock hangers welded to top corners of each door for suspending on overhead door channel track. Provide hangers with stainless steel removable locks to prevent doors from jumping track during operation while permitting ease of removal. Fabricate overhead track of 14-gauge stainless steel and weld to cabinet body. Provide bottom of doors with nylon door guides secured to bottom shelf. Guides shall not interfere with door removal.

I. HINGED DOORS

1. Hinged doors shall be double pan type constructed of 16-gauge stainless steel with inner pan set into outer pan and welded in place. Hinges shall be stainless steel cam action pin type fastened by means of counter sunk flat head stainless steel screws staggered on centers and tapped into  $\frac{1}{4}$ " thick stainless-steel bar stock welded behind door jamb. Doors shall be removable from hinges without the use of tools. Doors shall be held closed by permanent magnet closure devices. Doors shall be fitted with a full grip recessed type stainless steel flush pull handle. Provide hard rubber door stop bumpers.

J. SINKS

1. Sinks shall be fabricated of 14-gauge stainless steel with all interior corners coved on a  $\frac{3}{4}$ " radius both horizontally and vertically forming spherical corners.
2. Exposed edges of sink shall be finished with a 1  $\frac{1}{2}$ " diameter 180 degree rolled edge, rear and sides adjacent to adjoining surfaces shall have a backsplash turned up 10" high at a 90-degree angle on a  $\frac{3}{4}$ " radius and turned back 2  $\frac{1}{2}$ " on a 45-degree angle, then down  $\frac{1}{2}$ " at 90 degrees along back.
3. Multiple sink compartments shall be divided with double wall 14-gauge stainless steel partitions 1" wide rounded on top and all corners at a  $\frac{3}{4}$ " radius. Finish bottom, back and front with 14-gauge stainless steel to form one continuous sink with no overlapping joints or open spaces between sink compartments.
4. Integral drainboards shall be constructed of 14-gauge stainless steel. The front portion shall continue the 1  $\frac{1}{2}$ " diameter 180 degree rolled rim of the sink bowl on a continuous level horizontal plane. The surface of the drainboard shall be pitched from 2  $\frac{1}{2}$ " at the end away from the sink to 3" at the sink bowl. Sink and drainboard backsplash shall be continuous and level on the horizontal plane. All interior corners both vertical and horizontal shall be coved on a  $\frac{3}{4}$ " radius. Drainboards shall be reinforced with 1" x 4" x

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- 1", 12-gauge stainless steel "hat" channels extending front to rear tack welded to underside of drainboard for weld anchoring leg gussets.
5. Provide crossrails extending front to rear between legs, crossrails shall not extend along rear at sink to prevent interference with plumbing.
6. Built-in sink compartments shall be fabricated as an integral part of fixture with sink fully welded with adjacent top, weld ground smooth and polished.

K. MILLWORK

1. Millwork fabricator shop shall be a certified participant in AWI's Quality Certification Program (QCP) to standard "Premium" construction.
2. Tops shall be fabricated of 3/4" thick 5-7 ply BW marine grade plywood build up to a 1 1/2" thickness. All plastic laminate finished edges shall be applied prior to the surface laminate. Provide cross bracing around entire perimeter below tops and above all interior dividers to minimize deflection from equipment. Tops shall be fabricated in sections as large as possible to minimize field seams. Field seams shall be assembled utilizing TB-2 yellow glue. The bottom surfaces of all tops must be sealed with gray cabinet liner to comply with Board of Health requirements. Cut-outs for drop-in equipment shall be cut in the shop and with all edges sealed. All drop-in equipment shall be pre-fitted in top prior to delivery to the job site. All drop-in equipment shall be sealed with General Electric or equivalent clear silicon sealer after installation. Hardwood edges shall be applied prior to surface laminate. All hardwood to match for color and grain. Edges to be chamfered and finished as specified. Solid surface tops shall receive full plywood substrate with 3/4" x 3" batons for proper air space. All tops shall be prepared for installation of sneeze guards including additional blocking and / or cutouts.
3. All cabinet base and interiors shall be fabricated of 3/4" thick 5-7 ply marine grade plywood with high-pressure laminate finish. Recessed toe base shall be 6" high fabricated of 3/4" thick 5-7 ply marine grade plywood with 16-gauge stainless steel finish. Shelf pilasters to be recessed type 250WH with 253WH locking clips. Cabinet backs shall be fabricated of 1/4" thick MELA-MDF board. Cabinet ends to be dadoed for back and bottom and notched to receive aprons and kicks. Butt or dowel construction will not be acceptable. Cabinets shall be assembled with TB-2 yellow glue with screws and staples. Cabinets with finished backs shall be fabricated of 3/4" thick 5-7 marine grade plywood with high-pressure laminate finish. Cabinets over 48" in length shall have interior dividers. Dividers shall be dadoed into the bottom and notched for aprons. Dividers shall be notched as required for equipment. Aprons shall be large enough to conceal drop-in equipment and also to house control panels. Cabinet bases shall be fabricated in sections as large as possible to minimize field seams.
4. Doors shall be fabricated of 3/4" thick MDF board with high-pressure laminate finish and shall be furnished with three BLUM 75M5580 or 75M5680 European style concealed hinges. Door pulls shall be Hafele 116.39.437. Locks where required shall be cam style, keyed alike. Doors shall not exceed 27" in width and shall be of equal size.
5. Drawers shall be constructed of 3/8" thick birchwood with dove tail joinery. Drawer slides shall be Accuride 150 lb. full extension type with stainless steel ball bearing hardware.
6. Applied wood fascia panels and doors shall be stile and rail design. Panels to be recessed or raised as specified. All wood to be select for color and grain. Finish shall match stock color samples or custom to match furnished sample. All panels and doors to be equally sized per cabinet. Provide full wood louvered panels as required for equipment requiring

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air circulation. Finish all wood with stain followed by single coat of sealer. After sealer, apply one layer of Armourcote conversion varnish approved for use in food service with 55% gloss.

L. SOLID AND HARD SURFACE MATERIAL (“CORIAN” / “ZODIAQ”)

1. Provide counter top, tray slide, etc. of approved solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated on the food service and architectural detail drawings, routed and finished as directed. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a ¾” thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material

M. PAINTING

1. Galvanized steel shall be cleaned and degreased with mineral spirits, primed with a minimum of two coats of primer and spray finished with a minimum of two coats of gray epoxy enamel paint

N. LAMINATED PLASTIC

1. All exposed surfaces shall be faced with 1/16" thick high-pressure plastic laminate in color and pattern as specified.
2. All unexposed surfaces shall be faced with .020 or .030 gray thermoset decorative overlay.
3. Where the plastic laminate is to be bonded to removable or fixed panels the panels shall be fabricated of 3/4" thick close grain marine grade mahogany or birch plywood with surfaces bonded with waterproof glue.
4. Where the plastic laminate is to be bonded directly to the metal facing of a cabinet base table or counter, surfaces shall be bonded with contact adhesive.

O. CLOSURE TRIM

1. Provide closure trim pieces fabricated of 16-gauge stainless steel or of material and finish as specified, trim shall be one-piece constructions furnished to seal both horizontal and vertical junctures and openings

2.5 STAINLESS STEEL FINISHES

- A. General: Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal products” for recommendations relative to applying and designating finishes.

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1. Remove or blend tool and die marks and stretch lines into finish.
  2. Grind and polish surfaces to produce uniform directional textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Concealed Surfaces: Minimum of 80 grit finish.
- C. Exposed Surfaces: No. 4 finish (bright, directional polish) of 180 grit.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable temporary protective covering before shipment.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions with Installer for compliance with requirements for installation tolerances, service-utility connections and other conditions affecting installation and performance of food service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine roughing-in for piping, mechanical and electrical systems to verify actual locations of connections before installation

#### 3.2 INSTALLATION

- A. Set each item of fixed food service equipment securely in place, level and adjust to correct height. Anchor to supporting surface where required for sustained operation and use without shifting or dislocation. Provide concealed anchoring where possible. Adjust work surfaces to a level tolerance of 1/16" maximum offset and slope drainage surfaces at 1/16" per foot.
- B. Complete field assembly of field joints by welding or bolting utilizing the method as indicated with the fixture. Grind all field welds smooth and polish. Set and trim all gaskets to be installed as part of field assembly.
- C. Treat enclosed spaces that are inaccessible after food service equipment installation by covering all horizontal surfaces with powdered borax at a rate of 4 ounces per square foot.
- D. Provide closure trim pieces fabricated of 16-gauge stainless steel or of material and finish as specified, trim shall be one-piece construction furnished to seal both horizontal and vertical junctures and openings where the conditions given below occur:
1. Food service equipment is installed into wall openings. Trim shall apply to both sides of wall opening with all corners fully welded, ground smooth and polished.

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2. Two or more items of food service equipment are butted together.
  3. Food service equipment is installed against wall, columns other equipment resulting in a gap or juncture exceeding 1/4" in width.
  4. An open gap of any size between the juncture or joint between adjoining items of food service equipment, wall or column surfaces which might result in the penetration or collection of grease or vermin.
- E. Provide cut-outs and openings in food service equipment as required to extend plumbing, electric, steam or gas lines through the food service equipment either for interconnection of utility lines or final connection.
- F. Seal around each item of food service equipment with sealant for gaps or spaces less than 1/4" in width and with stainless steel trim for gaps or spaces exceeding 1/4" in width. Closure strips shall conform to the shape and size of the surfaces or juncture to be sealed and shall be neatly scribed for a tight fit.

### 3.3 PROTECTION AND CLEANING

- A. Provide final protection and maintain conditions in a manner acceptable to District, Manufacturer and Installer that ensure food service equipment is without damage or deterioration at the time of Substantial Completion.
- B. After completion of the food service equipment installation and completion of other major work in the food service area remove protective coverings and clean and sanitize all food service equipment both internally and externally. Restore exposed and semi-exposed finished to remove abrasions or other surface damage, polish exposed metal surfaces and touch-up painted surfaces. Replace work which cannot be successfully restored.

### 3.4 COMMISIONING

- A. Delay start-up of the food service equipment until utility services have been installed, completed and tested, balanced and adjusted for pressure and voltage, and until water and steam lines have been treated and cleaned for sanitation. Before start-up of the food service equipment lubricate in accordance with manufacturer's instructions.
1. Coordinate food service equipment startup with service-utility testing, balancing and adjustments. Do not operate steam lines before they have been cleaned and sanitized.
- B. Provide on-site demonstration and formal technical training by the manufacturer's technical representative for each item of food service equipment as required to instruct the District and its personnel in the safe operation and sanitation and maintenance of the food service equipment.
- C. Test each item of food service equipment for proper operation.
1. Repair or replace equipment that is defective in operation including units that operate below required capacity or that operate with excessive noise or vibration.

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2. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
5. Test water, drain, gas, steam, oil, refrigerant and liquid-carrying components for leaks. Repair or replace leaking components.
6. Train District's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing and preventive maintenance for each food service equipment item.
7. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout".
8. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data".
9. Schedule training with District through Construction Manager with at least seven days advance notice.

### 3.5 SCHEDULE OF EQUIPMENT

- A. Equipment Schedule: Refer to all Contract Documents pertaining to the food service areas. Equipment itemized along with brands and model numbers and salient features establish the standard for construction, operation and engineering criteria.
- B. Equipment indicated below is intended to establish the standard of quality of the food service equipment. Alternate "Equal" products by other manufacturers may be considered if equivalent in design, performance, durability and function.
- C. This document is the intellectual property of Corsi Associates and as such use by any other entity is prohibited.

ITEM #01                      WALK-IN COOLER/FREEZER COMBINATION

Quantity:                    One (1)

Manufacturer:              Bally / Kolpak / Arctic

Model:                        Size and shape as per plan

Construction:              Furnish and erect compartment sectional urethane insulated walk-in cooler / freezer assembly.

Walk-in assembly shall bear the UL and NSF label and shall meet 2009 Federal Regulations.

Ceiling and wall panels shall be constructed of 4" thick urethane insulation, assembly to be accomplished by the use of integral cam type locking device secured in place during the foaming process. Seams between panels shall be fully insulated with vinyl foamed-in-place gasket material.



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Ceiling and wall panels shall be finished of 18 gauge embossed aluminum on interior and exterior surfaces.

Walk-in assembly shall be provided with 1/8" thick aluminum diamond tread plate floor with NSF approved coved corners, insulated with 4" thick urethane insulation and reinforced with 3/4" thick 5-7 ply marine grade plywood underlayment. Floor installation shall be in accordance with manufacturer's recommended practice and shall sit in building floor depression. Building floor finish shall be flush and smooth to allow a level transition between the walk-in floor and the adjacent finished kitchen floor.

Walk-in assembly shall be furnished with 36" wide in-fitting type door and frame assemblies constructed of 16 gauge stainless steel provided with three self-closing cam action chrome plated hinge assemblies, handles and hardware.

Provide each door with 2" dial type flush mount thermometer with chrome plated bezel mounted in door frame.

Provide each door with triple pane observation and 36" high x 1/8" thick aluminum diamond tread kick plates on both interior and exterior side.

Provide each door with UL listed vapor-proof LED light fixture complete with toggle switch and pilot light and full perimeter frame condensation heater.

Provide four (4) additional UL listed vapor-proof LED ceiling mounted light fixtures complete with stainless steel mounting hardware. One (1) in freezer section and one (3) in cooler section.

Foodservice Equipment Contractor shall install ceiling mounted light fixtures and furnish materials and inter-wire light fixtures and switch.

Walk-in freezer assembly shall be furnished with heated pressure relief port.

Furnish and install 18 gauge embossed aluminum vertical trim angles and ceiling closure panels.

Furnish and install entire refrigeration system complete with Copeland semi-hermetic condensing units and insulated copper refrigeration lines charged with R448A refrigerant. Each condensing unit shall be interconnected to a low profile, high velocity evaporator coil in each walk-in compartment. Refrigeration system shall include all fittings, valves, switches, controls and all related components to comprise a complete operating unit of sufficient BTU capacity to maintain automatic operation of 35 degree F product temperature in cooler and -10 degree F product temperature in freezer.

Refrigeration system shall be provided with outdoor remote air cooled condensing units with each condensing unit to be located outdoors on the building roof.

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Condensing units shall be provided with winterized controls (low ambient package) including crankcase heater, head pressure control, dryers and galvanized steel stand with hinged louvered weather hood.

Provide all hangers and brackets as required to install refrigeration lines.

Construction Trade shall furnish all sleeves and openings through walls for passage of refrigeration lines.

Secure condensing unit stands to building roof; Roofing Trade shall provide water-proof roof opening for passage of refrigeration lines.

Foodservice Equipment Contractor shall furnish materials and inter-wire defrost time clock circuit for walk-in freezer, from condensing unit to evaporator coil.

Foodservice Equipment Contractor shall furnish materials and install (wrap and insulate with foam pipe insulation) heat tracing tape to evaporator coil condensate line in walk-in freezer.

Foodservice Equipment Contractor shall furnish and install copper tubing and extend evaporator coil condensate line to floor receptacle.

Set and adjust all temperature and defrost cycles.

Provide start-up and two year material and labor warranty on entire refrigeration system and five years manufacturer's warranty on compressor.

ITEM #02	EVAPORATOR, WALK-IN COOLER
Quantity:	One (1)
Manufacturer:	Bally / Kolpak / Arctic
Model:	Custom
Remarks:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #03	CONDENSING UNIT, WALK-IN COOLER
Quantity:	One (1)
Manufacturer:	Bally / Kolpak / Arctic
Model:	Custom
Remarks:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #04	EVAPORATOR, WALK-IN FREEZER
Quantity:	One (1)
Manufacturer:	Bally / Kolpak / Arctic
Model:	Custom
Remarks:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

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ITEM #05            CONDENSING UNIT, WALK-IN FREEZER  
Quantity:           One (1)  
Manufacturer:       Bally / Kolpak / Arctic  
Model:               Custom  
Remarks:           Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #06            PLASTIC WITH METAL FRAME SHELVING  
Quantity:           One (1)  
Manufacturer:       Metro / Eagle Group  
Model:               Super Erecta Pro  
Options:              PR2454NK3 Shelves (4)  
                         63UPK3 Posts (4)  
                         5MP Casters (2)  
                         5MPB Casters with brakes (2)  
Remarks:           Assemble into four tier unit(s) with bottom shelf 12" above finished floor.

ITEM #07            PLASTIC WITH METAL FRAME SHELVING  
Quantity:           Six (6)  
Manufacturer:       Metro / Eagle Group  
Model:               Super Erecta Pro  
Options:              PR2460NK3 Shelves (24)  
                         63UPK3 Posts (24)  
                         5MP Casters (12)  
                         5MPB Casters with brakes (12)  
Remarks:           Assemble into four tier unit(s) with bottom shelf 12" above finished floor.

ITEM #08            PLASTIC WITH METAL FRAME SHELVING  
Quantity:           Two (2)  
Manufacturer:       Metro / Eagle Group  
Model:               Super Erecta Pro  
Options:              PR2442NK3 Shelves (8)  
                         63UPK3 Posts (8)  
                         5MP Casters (4)  
                         5MPB Casters with brakes (4)  
Remarks:           Assemble into four tier unit(s) with bottom shelf 12" above finished floor.

ITEM #09            PLASTIC WITH METAL FRAME SHELVING  
Quantity:           Two (2)  
Manufacturer:       Metro / Eagle Group  
Model:               Super Erecta Pro  
Options:              PR2448NK3 Shelves (8)  
                         63UPK3 Posts (8)  
                         5MP Casters (4)  
                         5MPB Casters with brakes (4)  
Remarks:           Assemble into four tier unit(s) with bottom shelf 12" above finished floor.

ITEM #10            DUNNAGE RACK

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Quantity: Three (3)  
Manufacturer: Cambro / Metro / Eagle Group  
Model: DRS600131  
Options: DRLNK110 Camlink (3)

ITEM #11 PLASTIC WITH METAL FRAME SHELVING

Quantity: Three (3)  
Manufacturer: Metro / Eagle Group  
Model: Super Erecta Pro  
Options: PR2454NK3 Shelves (15)  
74UPK3 Posts (12)  
5MP Casters (6)  
5MPB Casters with brakes (6)

Remarks: Assemble into five tier unit(s) with bottom shelf 12" above finished floor.

ITEM #12 HIGH DENSITY SHELVING SYSTEM, TOP TRACK, 5 TIER

Quantity: One (1)  
Manufacturer: Metro / Eagle Group  
Model: TT17-E2460M2460P  
Remarks: Top-Track® EZ Order Model, nominal 17 ft. system length x 5 ft. width, consists of (1) 11-1/2 ft. track set, (8) 86" posts, (1) 24" tie bar end kit, (16) 74" Top-Track® mobile posts, (4) 24" mobile kits (stainless steel casters, bumpers, rollers), (24) 24"D x 60"W shelves, Super Erecta Pro polymer/wire shelving, NSF

Equipment per layout FS-1.0.

ITEM #13 CAN RACK SYSTEM

Quantity: One (1)  
Manufacturer: Eagle Group / Metro  
Model: CRC4

ITEM #14 SPARE NUMBER

ITEM #15 SPARE NUMBER

ITEM #16 WASHER/DRYER, STACKED

Quantity: One (1)  
Sup Info: Not in Foodservice Equipment contract, furnished by the District.

ITEM #17 SPARE NUMBER

ITEM #18 SPARE NUMBER

ITEM #19 SHELF, WALL MOUNT

Quantity: Two (2)  
Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: WS12120-14/3  
Sup Info: Furnish stainless steel mounting hardware of proper type for wall construction and to

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sustain weight while in use.

Construction Trade shall provide wall blocking as required for mounting.

ITEM #20 WORK TABLE, STAINLESS STEEL TOP

Quantity: One (1)  
Manufacturer: Eagle Group / Advance Tabco / John Boos  
Model: T30120SE-BS  
Options: E36A Welded base  
E59 Undershelf upgrade  
E22 Sink bowl, weld in (2)  
341189 Twist handle drain (2)  
-TB bracket (2)  
351585 Sink cover (2)  
E47 Sink cover holder  
YCORSI-502971-MOD Drawer (2)

ITEM #21 HAND SINK

Quantity: Three (3)  
Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: HSA-10-FAW  
Options: 318496 Paper towel dispenser (3)  
300602 Soap dispenser (3)  
-LRS Left and right side splashes (3)  
**356128 T&S Electric-Eye Faucet, splash mounted, with battery & AC adapter (3)**  
Sup Info: Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.

Construction Trade shall provide wall blocking as required for mounting.

Foodservice Equipment Contractor to verify soap dispenser and paper towel dispenser type with the Owner.

ITEM #22 TRASH RECEPTACLE

Quantity: Three (3)  
Manufacturer: Rubbermaid  
Model: FG354060GRAY  
Options: FG267360GRAY (3)

ITEM #23 REACH-IN FREEZER

Quantity: One (1)  
Manufacturer: Continental / Victory / True  
Model: 1FNSS  
Options: Stainless steel interior  
Stainless steel exterior  
Stainless steel case back  
Door hinged on left  
Exterior mounted digital thermometer

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Automatic condensate evaporator  
Swivel casters with polyurethane tires and front locking brakes  
Plug and cord set  
Two additional shelves

ITEM #24                      EXHAUST HOOD  
Quantity:                    One (1)  
Manufacturer:              Captive Aire / Accurex  
Model:                        Size and shape as per plan  
Construction:              Furnish and install exhaust hood with integral plenum box make-air system.

Entire exhaust ventilation system shall be constructed in compliance with UL, NSF, NFPA, IMC 2018 (including automatic start-up of the exhaust and supply ventilation upon activation of any cooking appliance) and any prevailing statutes and codes.

Hood shall be 11'-0" long constructed in one section of 18 gauge 304 stainless steel with all seams continuously welded, ground smooth and polished. Hood mounted utility cabinet shall be 1'. Provide a full compliment of stainless steel "high efficiency" Captrate Solo baffle type grease extractors.

Furnish remote bulb thermostat with watertight hardware and install in either the exhaust plenum of the hood or in the exhaust duct. Provide NEMA 3 control panel box with hinged front cover complete with supply and exhaust fan contactors wired to an adjustable thermostat control, field wiring terminal strip and on-off switch.

Provide 18 gauge 304 stainless steel supply and exhaust duct collar.

Provide 18 gauge 304 stainless steel insulated supply air plenum box assembly with internal air volume control damper integral along the face of the hood. Mount in finished ceiling along face of hood and furnish full length stainless steel perforated removable panels for discharge of supply air along entire face of hood.

Provide stainless steel threaded hanger rods complete with stainless steel mounting hardware for securing to structural ceiling.

Mechanical (HVAC) Trade shall furnish and install a complete exhaust air handling system including exhaust fan and controller, fan start-stop switch with status lights, 16 gauge insulated welded ductwork from exhaust collar on exhaust hood to fan, hinged roof curb with grease trough and removable grease container.

Mechanical (HVAC) Trade shall install exhaust hood heat detector(s) in exhaust hoods with multiple exhaust collars in the exhaust duct just after the point of the pant leg juncture; this includes punching of the required hole in the duct and installation of the heat detector and fitting.

Mechanical (HVAC) Trade shall furnish and install a complete supply air handling system including supply fan and controller (with maintainable filter system) and supply air heater with thermostat control (to temper incoming supply air below 65 degree

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F ambient), fan start-stop switch with indicator lights, galvanized steel ductwork from supply collar on exhaust hood to fan and roof curb.

Electrical Trade shall furnish and install interconnecting wiring between fan motors, controllers and switches.

Electrical Trade shall furnish and install inter-wiring of cooking appliance start-up inter-lock device and the supply and exhaust ventilation system and wire per the manufacturer's instructions and per applicable codes.

Furnish three (3) UL listed vapor-proof recessed LED light fixtures wired to a common on-off switch with stainless steel cover plate located on the wall adjacent to the exhaust ventilator.

Electrical Trade shall furnish materials and inter-wire light fixtures to wall mounted utility cabinet.

Mechanical (HVAC) Trade shall furnish and install INVERTER DUTY THREE PHASE exhaust fan and controller.

Mechanical (HVAC) Trade shall furnish fans set compatible with variable frequency drive specification.

Electrical Trade shall furnish and install Interconnecting wiring of the system between the exhaust hood sensors, remote frequency drive unit and exhaust and supply fan motors.

Furnish and install 18 gauge stainless steel ceiling closure panels extending from the top of the exhaust ventilator to the finished ceiling. Panels shall be removable without the use of tools for access.

Furnish and install 18 gauge 304 stainless steel wall panels extending from the bottom of the rear of the exhaust hood to the upper edge of the baseboard molding and extending along the full length of all wall surfaces. Wall panel sections shall be fitted with 1/2" wide off-set seams at intermediate joints to allow panel sections to fit tightly against the wall and to result in watertight seams. Secure wall panels to building wall with wall panel adhesive of proper type for wall construction. Seal end seams with General Electric or equivalent clear silicone sealer.

Electrical Trade shall provide the inter-wiring between the control enclosure, fire system, supply and exhaust fans and variable frequency drives and duct riser temperature switch.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #24.1      HOOD CONTROL PANEL  
Quantity:      One (1)

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Manufacturer: Captive Aire  
Model: Size and shape per plan  
Sup Info: Furnish 18 gauge stainless steel utility and fire system enclosure cabinet with hinged access doors for both hood and fire system controls and fire suppression tanks. System shall be listed by ETL (UL 508A) NSF, NFPA, IMC 2018 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17-27. Cabinet may be freestanding wall type or integral with exhaust hood as shown on the contract drawings. Furnish stainless steel mounting hardware of proper type for wall construction for wall mounted cabinet.

Furnish and install variable volume motor control center with variable frequency drive, input / output processor and keypad enclosed within a stainless steel utility cabinet for remote mounting. System shall include, but not be limited to, electronic variable volume motor starters with thermal overload, input / output processors, control keypad, temperature and optic sensors and plug and play cables. Temperature sensor shall be mounted in the exhaust duct collar; optic sensor shall be mounted inside the ends of the hood with air purge units mounted on top.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #24.2 FIRE PROTECTION SYSTEM

Quantity: One (1)  
Manufacturer: Captive Aire  
Model: TANK  
Sup Info: Furnish and install in exhaust hood, plenum and surface fire protection system.

TANK Fire Suppression is a pre-engineered, stored-pressure wet chemical solutionextinguishing system.

TANK Fire Suppression System shall be UL & ULC listed in accordance with UL300,UL1254, ULCORD-C1254.6.

Microprocessor-based control board shall be ETL Listed to UL Standard 864 and CAN/ULC-S527-11.

TANK Fire Suppression System intended for installation and for use in accordance withthe National Fire Protection Association Standards:

1. Wet Chemical Extinguishing Systems, NFPA 17A
2. National Electrical Code, NFPA 70
3. National Fire Alarm & Signaling Code, NFPA 72

New York City and FDNY approved under COA# 5870.

California State Fire Marshal (CFSM), Listing No. 7085-2199:0502.

A pre-engineered, fixed pipe, automatic wet chemical agent fire suppression



system for protection of all hazard areas associated with cooking operations, including exhaust hoods, plenums, ductwork, and cooking appliances.

Exhaust hood fire system components to be factory installed.

#### **Cylinder and Valve Assembly**

1. The cylinders shall have a tin-nickel alloy plated brass valve with pressure gauge.
2. Wet chemical agent shall be contained in one or more stored pressure DOT/TC rated steel cylinder and valve assemblies.
3. Each cylinder is factory-filled with liquid fire suppressant and pressurized to 200 PSIG at 70°F.

#### **Distribution Nozzles**

4. Nozzles shall be located to protect the exhaust ducts, plenums, and all cooking appliances requiring protection.
5. All nozzles shall be equipped with a metal blow off cap. The cap prevents contamination from entering the pipe network and is designed to pop-off upon system discharge, allowing agent to flow to the protected hazard area.
6. All nozzles shall incorporate a stamped part number to easily identify nozzle type.

#### **Distribution System**

7. The distribution system shall consist of Copper, Schedule 40 black iron, chrome-plated or stainless-steel pipe and fittings. All exposed piping and fittings must be chrome-plated or stainless steel.
8. Fittings shall be minimum class 150. Galvanized fittings shall not be used.

#### **Suppression System**

9. The system control equipment shall be capable of all functions associated with automatically and manually discharging the wet chemical agent from all cylinder and valve assemblies, including automatic shutdown of the heat source or fuel and electrical power to all protected areas upon system discharge.
10. Liquid Fire Suppressant shall be Aqueous Potassium Carbonate (APC).
11. All mechanical components of the actuator kit shall be enclosed.
12. The actuator kit shall be capable of automatic or manual activation means.
13. Supervisory Pressure Switch added to monitor operating system pressure.
14. For manual activation, an electrically operated manual release shall be used to actuate the system manually.
15. For automatic activation, the system will be activated by a Firestat (heat) detector.

#### **Electrical**

16. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnection provided at hood control panel for the signal to shut down all electricity in and under the exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in the event of fire system activation by others.

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17. Printed circuit board with microprocessor-based controller that provides all the necessary monitoring, timing, and supervision functions required for the reliable operation of the fire system.
18. Independent supervised loops incorporate redundancy and fault detection.
19. Real-time cloud-based monitoring connection provided with system by ownership.
20. Primary power supply, with battery backup for power loss.
21. All wiring must be in accordance to NFPA 70 and the Authority Having Jurisdiction(AHJ).
22. Electric gas valve provided for equipment below exhaust hood. Coordinate size and installation with Plumbing Division.
23. All wiring is to be in accordance with the applicable manufacturer's instructions for the fire alarm control panel, gas shut-off valve, manual reset relay, and contractor supplied shut-off devices.

As part of this item, provide wall mounted type K handheld portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.

Inter-wiring of the fire system to the exhaust hood shall be furnished and installed by the Electrical Trade.

Provide as part of fire system, electrically operated gas supply line shut-off valve (two required for "loop" gas service) to interrupt gas supply to all gas operated cooking appliances. Gas valve shall be provided with manual reset to prevent gas flow to pilot devices on appliances prior to restart.

Provide one remote manual pull station to actuate fire system in the event of a fire.

Plumbing Trade shall install gas shut-off valve(s) in gas supply line.

Electrical Trade shall inter-wire gas shut-off valve(s) to fire system.

Electrical Trade shall furnish and install electric shunt-trip circuit breakers or electric shut-off contactors to interrupt electric power to all electrically operated cooking appliances.

Provide dry contacts in fire system to interface with building fire alarm system as required, electrical tie-in shall be the responsibility of the Electrical Trade.

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Provide as part of fire system, start-up testing of the fire system as required by local fire codes. Subsequent testing of the fire system for a period of one year after start-up shall be included as part of this contract.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

Install in accordance with manufacturer's instructions, drawings, written specifications, manufacturer's installation manual, and all applicable building codes.

Six-month and twelve-month inspections, servicing, and replacement of components as per NFPA 96 to be provided by the General Contractor or Owner.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #25                      CONVECTION OVEN  
Quantity:                    One (1)  
Manufacturer:                Blodgett / Garland / Vulcan  
Model:                        DFG-100 DBL  
Options:                      Solid state thermostat  
                                    Mechanical timer  
                                    Stainless steel draft diverter  
                                    4 1/4" low profile swivel casters with polyurethane tires and front locking brakes  
                                    Stainless steel solid back panel  
                                    Gas manifold  
                                    Gas pressure regulator  
                                    Dormont 1675KITCF2S48 Gas hose kit  
Sup Info:                    Foodservice Equipment Contractor shall install disconnect at wall connection and to cooking appliance per manufacturer's instructions.  
  
                                    Foodservice Equipment Contractor shall provide and secure restraining cable between wall and equipment.

ITEM #26                      CONVECTION STEAMER, GAS  
Quantity:                    One (1)  
Manufacturer:                Groen / Cleveland / Market Forge  
Model:                        HY-10SG-24  
Options:                      Low profile swivel casters with polyurethane tires and front locking brakes  
                                    Stainless steel solid back panel  
                                    Gas manifold  
                                    Gas pressure regulator  
                                    Drain tempering valve  
                                    Dormont 1675KITCF2S48 Gas hose kit  
                                    Dormont W50BP48 Water hose kit (2)  
Sup Info:                    Foodservice Equipment Contractor shall install disconnect at wall connection and to cooking appliance per manufacturer's instructions.

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Foodservice Equipment Contractor shall provide and secure restraining cable between wall and equipment.

ITEM #26F WATER FILTRATION SYSTEM FOR CONVECTION STEAMER

Quantity: One (1)

Manufacturer: Everpure / 3M / Optipure

Model: EV9797-50

Options: EV961716 Cartridge

EV979902 Scalestick cartridge

EV979833 Scalekleen scale remover

Sup Info: Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.

General contractor shall provide wall blocking as required for mounting.

Foodservice Equipment Contractor shall install steamer filter system in water supply line and furnish and install interconnecting piping between water filter and steamer water inlet.

ITEM #27 2-BURNER RANGE

Quantity: One (1)

Manufacturer: Garland / Vulcan / Imperial

Model: C18-7S

Options: Stainless steel front and sides

Stainless steel belly bar, standard

Backguard flue riser with single high shelf

Low profile swivel casters with polyurethane tires and front locking brakes

Stainless steel solid back panel

3/4" Rear gas connection, including end cap & cover

Gas manifold

Gas pressure regulator

Dormont 1675KITCF2S48 Gas hose kit

Sup Info: Foodservice Equipment Contractor shall install disconnect at wall connection and to cooking appliance per manufacturer's instructions.

Foodservice Equipment Contractor shall provide and secure restraining cable between wall and equipment.

ITEM #28 SPARE NUMBER

ITEM #29 SPARE NUMBER

ITEM #30 HEATED CABINET, PASS-THRU

Quantity: Two (2)

Manufacturer: Continental / Victory / True

Model: DL1WI-SS-PT

Options: Stainless steel interior (2)

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Stainless steel exterior (2)  
Hinging per plan (2)  
Exterior mounted digital thermometer (2)  
Plug and cord set (2)  
Universal pan slide assembly (2)

ITEM #31 REFRIGERATOR, PASS-THRU

Quantity: Two (2)  
Manufacturer: Continental / Victory / True  
Model: 1RNSSPT  
Options: Stainless steel interior (2)  
Stainless steel exterior (2)  
Hinging per plan (2)  
Exterior mounted digital thermometer (2)  
Automatic condensate evaporator (2)  
Plug and cord set (2)  
Universal pan slide assembly (2)

ITEM #32 WORK TABLE, STAINLESS STEEL TOP

Quantity: Three (3)  
Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: T3084SE  
Options: E36A Welded base (3)  
YCORSI-502971-MOD Drawer (6) (2 per table)  
DOS1284-14/3 Double overshelf (3)

ITEM #33 MICROWAVE OVEN

Quantity: One (1)  
Manufacturer: Panasonic / ACP Amana  
Model: NE-1054F

ITEM #34 WORK TABLE, STAINLESS STEEL TOP

Quantity: One (1)  
Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: T3084SE  
Options: E36A Welded base  
YCORSI-502971-MOD Drawer (2)  
DOS1284-14/3 Double overshelf  
MOS1284R Microwave shelf

ITEM #35 SPARE NUMBER

ITEM #36 SPARE NUMBER

ITEM #37 THREE COMPARTMENT SINK

Quantity: One (1)  
Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: FN2860-3-18-14/3

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Options: 313296 Pre-rinse faucet  
313297 Add-a-faucet  
301190 Pre-rinse wall bracket  
313293 Faucet  
341189 Twist handle drain (3)  
-TB Twist bracket (3)  
326271 Sink cover (3)  
E47 Sink cover holder

ITEM #38 POT SHELF  
Quantity: One (1)  
Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: WSP1260  
Options: 300696 additional pothooks (5)  
Sup Info: Includes (5) pothooks.

Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.

Construction Trade shall provide wall blocking as required for mounting.

ITEM #39 BUN PAN RACK  
Quantity: **One (1)**  
Manufacturer: Channel / Nexel  
Model: 404A

ITEM #40 FOOD WASTE DISPOSER  
Quantity: One (1)  
Manufacturer: Salvajor / In-sinkerator  
Model: 300-CA-ARSS-LD-PP  
Options: 18" Cone with nozzle

18CC 18" Stainless steel cone cover  
PP PP-type control panel with mounted solenoid valve, flow control & pressure switch for all controls  
980105 Mounting bracket  
DP Dejamming prong  
Sup Info: Foodservice Equipment Contractor shall furnish and install interconnecting piping and all components or parts as required by disposer manufacturer or as supplied as part of disposer in accordance with the manufacturer instructions.

Foodservice Equipment Contractor shall furnish and install all interconnecting wiring as required between disposer motor and control device.

Mount to control panel to wall or mounting bracket with stainless steel mounting hardware of proper type for application.

Construction Trade shall reinforce wall as required to support weight of control panel while in use.

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ITEM #41 L-SHAPED SOILED DISHTABLE

Quantity: One (1)

Manufacturer: Eagle Group / John Boos / Advance Tabco

Model: Custom

Construction: Top shall be fabricated of 14 gauge stainless steel. Exposed edges shall be 3" high, turned up on a 3/4" radius, terminating into a 1-1/2" diameter, 180 degree rolled edge. Provide backsplash along adjoining surfaces with top turned up integrally 10" high on a 3/4" radius at a 90 degree angle, turned back 2-1/2" on a 45 degree angle and down 1/2" on a 45 degree angle. Where the dishtable top enters the dishmachine, backsplash and top shall be turned down into the mouth of the dishmachine and fastened thereto in a watertight manner, as recommended by the manufacturer of the dishmachine.

Pre-rinse sink shall be fabricated of 14 gauge stainless steel with interior corners coved on a 3/4" radius and constructed integrally with dishtable top. Locate pre-rinse sink 1" from the inside roll of the dishtable front edge. Sink size shall be 20" long x 20" wide x 10" deep.

Punch top and provide T&S Brass & Bronze Works B-113 pre-rinse assembly with spray handle and B109 wall bracket.

Furnish and install Component Hardware E32-4900 stainless steel open waste outlet with flat strainer plate.

Provide 16 gauge stainless steel, perforated removable scrap basket with interior corners coved on a 3/4" radius. Scrap basket to fit inside pre-rinse sink, set 1/8" clear of sides of pre-rinse sink and provided with four 1" high stainless steel tubular fully enclosed legs. Provide scrap basket with two 1" diameter, stainless steel tubular rack guides, fully welded to sides of scrap basket and set flush with dishtable top surface.

Fabricate pass window frame and sill assembly of 14 gauge stainless steel. Coordinate length, width and wall thickness of wall opening per architectural drawings. Pass window frame shall be 2" wide on top and sides turned back 1" at 90 degrees to wall surface. Sill shall be fabricated with both edges turned down 2" at 90 degrees returned to wall 1" at 90 degrees with ends closed to sides. Fabricate frame and sill with full perimeter field joint to facilitate installation into wall opening, fully weld and polish field joint after installation into wall opening. Secure frame and sill assembly to wall opening in a concealed manner utilizing stainless steel fasteners and of a type suitable for wall construction.

Furnish and install manually operated jamb mounted counter shutter assembly in pass window opening. Shutter assembly frame, guides, bracket plates, hood and slats shall be fabricated of 16 gauge stainless steel; shutter assembly shall be provided less sill. Provide chrome plated cylinder type lock assembly on reinforced bottom bar. Fabricate frame with split frame assembly to facilitate installation into wall opening. Secure frame assembly to wall opening in a concealed manner per manufacturer instructions utilizing stainless steel fasteners and of a type suitable for wall

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construction.

Provide provisions for Item #40 food waste disposer.

Dishtable shall be reinforced with 14 gauge stainless steel, 1" x 4" x 1" "hat" channels welded to underside of dishtable top, front to rear at legs for weld anchoring leg gussets, and longitudinally the full length of the dishtable at center of top between leg channels.

Mount on leg assembly constructed of 1-5/8" diameter 16 gauge stainless steel tubing. Each leg shall be provided with a stainless steel bullet shaped adjustable foot. Fasten each leg to a 3-1/2" high stainless steel conical shaped die-formed gusset, fully welded to leg mounting channel.

Provide 1-1/4" diameter 16 gauge stainless steel tubular cross railing running between legs at a point 10" above the finished floor. Railing shall be continuously welded to legs provide a smooth coved radius.

ITEM #42           POT SHELF  
Quantity:       One (1)  
Manufacturer:   Eagle Group / John Boos / Advance Tabco  
Model:          WSP1236  
Options         300696 additional pothooks (3)  
Sup Info:       Includes (3) pothooks.

Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.

Construction Trade shall provide wall blocking as required for mounting.

ITEM #43           TRASH RECEPTACLE, 55 GAL  
Quantity:       One (1)  
Manufacturer:   Rubbermaid  
Model:          FG265500GRAY  
Options:        FG265400GRAY Lid  
                  FG264000BLA Dolly

ITEM #44           WAREWASHER  
Quantity:       One (1)  
Manufacturer:   Hobart / Champion / Jackson  
Model:          AM16T-ASR  
Options:        WTRHAMARREST-AM16 Water hammer arrestor  
                  Fan activation switch  
                  Drain tempering kit

ITEM #45           CONDENSATE HOOD  
Quantity:       One (1)  
Manufacturer:   Captive Aire / Accurex



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Model: Size and shape per plan  
Construction: Furnish and install condensate hood.

Entire condensate ventilation system shall be constructed in compliance with UL, NSF and any prevailing statutes and codes.

Fabricate entire hood of 18 gauge 304 stainless steel fully welded watertight construction.

Provide stainless steel welded hanger mounting clips with threaded stainless steel hanger and structural ceiling providing necessary angles and channels and utilizing stainless steel mounting hardware.

Mechanical (HVAC) Trade shall provide stainless steel welded ductwork (horizontal duct runs shall be pitched back toward condensate hood) and fan to comprise a complete condensate exhaust system.

Electrical Trade shall install fan switch with indicator lights located on dish machine and inter-wire to fan.

Furnish and install plastic drain tubing from nipple on bleeder drain outlet to soiled dishtable top surface.

Furnish and install 18 gauge stainless steel ceiling closure panels extending from the top of the exhaust ventilator to the finished ceiling. Panels shall be removable without the use of tools for access.

Furnish and install 18 gauge 304 stainless steel wall panels extending from the bottom of the rear of the exhaust hood to the upper edge of the baseboard molding and extending along the full length of all wall surfaces. Wall panel sections shall be fitted with 1/2" wide off-set seams at intermediate joints to allow panel sections to fit tightly against the wall and to result in watertight seams. Secure wall panels to building wall with wall panel adhesive of proper type for wall construction. Seal end seams with General Electric or equivalent clear silicone sealer.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #46 BLOWER/DRYER, WAREWASHER  
Quantity: One (1)  
Manufacturer: San-Aire Industries  
Model: PD-100-M  
Options: SMB-PD-100M Standard wall mount bracket  
FILTERX4 Filter Set, 6" x 20" x 3/8", washable, for PD-100M/100MCORR/100F, set of 4

ITEM #47 CLEAN DISHTABLE  
Quantity: One (1)

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Manufacturer: Eagle Group / John Boos / Advance Tabco  
Model: CDTL-108-14/3

ITEM #48 POT SHELF

Quantity: One (1)

Manufacturer: Eagle Group / John Boos / Advance Tabco

Model: WSP1260

Options: 300696 additional pothooks (5)

Sup Info: Includes (5) pothooks.

Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.

Construction Trade shall provide wall blocking as required for mounting.

ITEM #49 SNACK RACK

Quantity: Two (2)

Manufacturer: Metro / Eagle Group

Model: Super Erecta Pro

Options: PR1824NK3

63UPK3 Posts (4)

5MP Casters (2)

5MPB Casters with brakes (2)

Black matte finish (2)

Remarks: Assemble into four tier unit(s) with bottom shelf 12" above finished floor.

ITEM #50 MILK COOLER

Quantity: Two (2)

Manufacturer: True / Beverage Air

Model: TMC-34-DS-SS-HC

Options: Swivel casters with polyurethane tires and front locking brakes (2 sets)

Corner bumpers (2)

ITEM #51 HOT FOOD COUNTER

Quantity: Two (2)

Manufacturer: Duke / LTI / Delfield

Model: TEHF-60SS

Options: P-LAM Veneer plastic laminate on body (2)

MOD-4P Veneer on customer's side (2)

3BTS-HD-4CU Tray Slide, customer's side, (3) tubular Ø 1" bars, stainless steel, on hinged brackets, end caps, mounted 30"H (2)

445-4S-HD-OP Cutting Board/Shelf, operator's side, 10"D, 18ga stainless steel shelf, (3) hinged brackets, shelf mounted flush to counter top (2)

MOD-2S-4CU Kick plate, customer side, stainless steel (2)

5" poly swivel casters & brakes (2)

ILD Interlock device (2)

Fill faucet (2)

Owner/Architect to select laminate finish (2)

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ITEM #51.1 HOT FOOD COUNTER SNEEZE GUARD

Quantity: Two (2)  
Manufacturer: Duke / PMG / Versaguard  
Model: TS462-60  
Options: TS400LED-4 LED light (2)  
TS400HT-4 Radiant heater (2)  
3/8" tempered glass (2)  
1/4" glass end panels (2)  
1" stainless steel tube posts (2)

ITEM #52 SOLID TOP COUNTER

Quantity: Two (2)  
Manufacturer: Duke / LTI / Delfield  
Model: TST-18SS  
Options: SOLID-HD-1CU Tray slide, customer side, solid stainless steel, hinged (2)  
MOD-2S-E Kick Plate, end, stainless steel, recessed, screw attached, 1/2" above floor for easy rolling (2)  
P-LAM Veneer plastic laminate on body (2)  
MOD-1P Veneer on customer side (2)  
ILD Internal locking device (2)  
5" dia. gray poly swivel casters & brakes (2)  
Owner/Architect to select laminate finish (2)

ITEM #53 COLD FOOD COUNTER

Quantity: Two (2)  
Manufacturer: Duke / LTI / Delfield  
Model: TST-60SS  
Options: ILD Internal locking device (2)  
SOLID-HD-4CU Tray Slide, customer's side, 60" W x 12-1/4" D, solid stainless steel, on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 30" high (2)  
MOD-2S-4CU Kick Plate, customer's side, stainless steel, recessed, screw attached, 1/2" above floor for easy rolling (2)  
P-LAM Veneer plastic laminate on body (2)  
MOD-4P Veneer on customer side (2)  
CUT-OP4 Rectangular cutout with reinforced turn down edges & corners welded closed, in counter top, body panel or a shelf, counter top max. right to left is 4" less than unit length (2)  
Cutting board on operator side, stainless steel, hinged (2)  
5" dia. gray poly swivel casters & brakes (2)  
District/Architect to select laminate finish (2)

ITEM #53.1 COLD FOOD COUNTER SNEEZE GUARD

Quantity: Two (2)  
Manufacturer: Duke / PMG / Versaguard  
Model: TS462-60  
Options: TS400LED-4 LED light (2)

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3/8" tempered glass (2)  
1/4" glass end panels (2)  
1" stainless steel tube posts (2)

ITEM #54            FROST TOP, DROP-IN  
Quantity:        Two (2)  
Manufacturer:    Duke / LTI / Delfield  
Model:           RFT2-SL  
Options:          Drain (2)

ITEM #55            CASHIER COUNTER  
Quantity:        One (1)  
Manufacturer:    Duke / LTI / Delfield  
Model:           TCS-30SS  
Options:          CS-DR-LK Stainless steel drawer, with lock and keys  
                     SOLID-HD-32CL Tray Slide, cashier's left, 32" W x 12-1/4" D, solid stainless steel,  
                     on hinged brackets, with (2) 1/8" die-formed rubbing tracks, & mounted 34" high  
                     MOD-2S-2CL Kick Plate, cashier's left  
                     MOD-2S-2CR Kick Plate, cashier's right  
                     MOD-2S-2OC Kick Plate, opposite cashier  
                     P-LAM Veneer plastic laminate on body  
                     MOD-2P-CL Veneer on cashier's left  
                     MOD-2P-OC Veneer opposite cashier  
                     5" dia. gray poly swivel casters & brakes  
                     Owner/Architect to select laminate finish

ITEM #56            P.O.S. STATION  
Quantity:        One (1)  
Sup Info:        Not in Foodservice Equipment contract, furnished by the District.

ITEM #57            NOVELTY ICE CREAM  
Quantity:        One (1)  
Sup Info:        Not in Foodservice Equipment contract, furnished by the District.

ITEM #58            WORK TABLE, STAINLESS STEEL TOP  
Quantity:        One (1)  
Manufacturer:    Eagle Group / John Boos / Advance Tabco  
Model:           T3630SE-BS  
Options:          E36A Welded base  
                     E59 Undershelf upgrade

ITEM #59            DUNNAGE RACK  
Quantity:        One (1)  
Manufacturer:    Cambro / Metro / Eagle Group  
Model:           DRS480480  
Options:          DRLNK110 Camlink

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END OF SECTION 114000

## SECTION 116143 - STAGE CURTAINS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Stage curtains.
  - 2. Draw-curtain tracks.

#### 1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Delegated-Design Submittal: For stage-curtain systems and attachments to structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.
- B. Product certificates.
- C. Sample warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

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## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of stage curtains.

## 1.7 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 STAGE-CURTAIN SYSTEMS

- A. Description: Complete stage-curtain systems, including stage curtains and tracks; with necessary accessories for support and operation.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stage-curtain systems, including comprehensive engineering analysis and attachments to building structure, using performance requirements.
- B. Structural Performance: Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads.
- C. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Flame-Propagation Resistance: Passes NFPA 701.
    - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.
    - b. Permanently attach 12-inch- (300 mm-) square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

## 2.3 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.
1. Basis of Design product: Rose Brand, Crescent Velour, 20 oz., 100% Polyester.
  2. Noise Reduction Coefficient NRC: 0.95
  3. Color/Texture/Pattern: As selected by Architect from manufacturer's full range

## 2.4 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.
- B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:
1. Vertical Hems: Minimum 2 inches (50 mm) wide, with not less than a 1-inch (25-mm) tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.
  2. Turnbacks: Provide leading-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches (300 mm) of face fabric, with not less than a 1-inch (25-mm) tuck, and vertically secured by sewing.
  3. Top Hems: Reinforced by double-stitching 3-1/2-inch- (89-mm-) wide, heavy, jute or laminated synthetic webbing to top edge on back side of curtain with not less than 2 inches (50 mm) of face fabric turned under.
- C. Fullness:
1. ***50 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by sewing additional material into 3-inch (75-mm) double-stitched, flat, box pleats spaced at 12 inches (300 mm) o.c. along top hem reinforcement.***
- D. Grommets: Brass, No. 3, or No. 4. For black curtains, provide brass or aluminum grommets with black finish.
- E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:
1. For flat curtains without fullness: 4-inch (100-mm) lined hem with pocket for sliding pipe or conduit weight and stiffener into bottom of curtain, and with a concealing flap of same fabric in front of pocket made 2 inches (50 mm) longer than bottom edge of pocket.
  2. For curtains with fullness:



- a. Curtains That Do Not Hang to Floor: Hems not less than 3 inches (75 mm) deep, and with open ends of hems sewn closed.
- b. Floor-Length Curtains: Hems not less than 6 inches (150 mm) deep, with 1-inch (25-mm) weight tape sewn to top seam of the bottom hem, clear of the finished bottom edge, and with open ends of hems sewn closed.

## 2.5 ALUMINUM CURTAIN TRACK

- A. Aluminum Track: Extruded aluminum, ASTM B221 (ASTM B221M); alloy and temper as recommended by manufacturer for strength and corrosion resistance; black paint finish; complete with necessary accessories for support and operation.
  1. Basis of Design manufacturer: adc tracks, 1-800-360-2321, [info@automaticdevices.com](mailto:info@automaticdevices.com)
  2. Aluminum Thickness: As recommended by manufacturer for loads and operation.
- B. Curtain Rails: Provide end stops for track rails.
- C. Curtain Carriers: Standard carriers, with a quantity of carriers sufficient for track length, to suit curtain fabrication. Include one master carrier for each leading curtain edge.
- D. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- E. Track-Lap Clamp: Metal to match track channel for attaching two tracks at center overlap.
- F. Manual Walk-Along Operation: Fabricate curtain track without cord, cable, pulleys, or floor pulley.
- G. Manual Cord Operation: Fabricate curtain track with cord, pulleys, and floor pulley.
  1. Operating Line: 3/8-inch- (9-mm-) diameter, stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.
  2. End Pulleys: One single dead-end and one double live-end pulley. Provide sheave(s) with shielded ball bearing(s) housed in plated-steel body finished to match track. Provide with bracket for securing off-stage curtain end.
  3. Floor Pulley: Sheave with shielded ball bearing housed in plated-steel body, painted black. Spring-tensioned type. Adjustable type.

## 2.6 STEEL CURTAIN TRACK

- A. Steel Track: Roll-formed, galvanized, commercial-quality, zinc-coated steel sheet, ASTM A653/A653M; G60 (Z180) coating designation; with continuous bottom slot and

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with each half of track in one continuous piece; complete with necessary accessories for support and operation.

1. Basis of Design manufacturer: adc tracks, 1-800-360-2321, [info@automaticdevices.com](mailto:info@automaticdevices.com)
2. Steel Thickness: As recommended by manufacturer for loads and operation.

a. Heavy Duty: Minimum 0.079 inch (2.01 mm).

- B. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- C. Track-Lap Clamp: Metal to match track channel for attaching two tracks at center overlap.
- D. Curtain Rails: Provide end stops for track rails.
- E. Curtain Carriers: Standard carriers, with a quantity of curtain carriers sufficient for track length, to suit curtain fabrication. Include one master carrier for each leading curtain edge.
- F. Manual Cord Operation: Provide with cord operating line, 3/8-inch- (9-mm-) diameter, stretch-resistant operating cord of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Install stage-curtain system according to curtain and track manufacturer's written instructions.

#### 3.2 TRACK INSTALLATION

- A. Ceiling-Mounted Track: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.
- B. Install track for center-parting curtains with not less than 24-inch (600-mm) overlap of track sections at center, supported by track lap clamps.

#### 3.3 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with snap hooks.

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3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain stage curtains and tracks.

3.5 SPECIAL REQUIREMENTS

- A. Final design and details of stage curtain system to be coordinated with owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Insulation Materials:
  - a. Flexible elastomeric.
  - b. Mineral fiber.
- 2. Insulating cements.
- 3. Adhesives.
- 4. Sealants.
- 5. Field-applied jackets.
- 6. Tapes.
- 7. Securements.
- 8. Corner angles.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

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1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Fibrex Insulations Inc.; Coreplus 1200.
    - b. Johns Manville; Micro-Lok.
    - c. Knauf Insulation; 1000(Pipe Insulation.
    - d. Manson Insulation Inc.; Alley-K.
    - e. Owens Corning; Fiberglas Pipe Insulation.
  - 2. Type I, 850 deg F (Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.
  - 2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-76-8.
    - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    - c. Marathon Industries, Inc.; 405.
    - d. Mon-Eco Industries, Inc.; 44-05.
    - e. Vimasco Corporation; 750.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: Aluminum.
  - 6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Products, Division of ITW; CP-76.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.

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5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.4 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.5 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    - b. Compac Corp.; 104 and 105.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
  2. Width: 3 inches.
  3. Thickness: 11.5 mils.
  4. Adhesion: 90 ounces force/inch in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch in width.
  7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    - b. Compac Corp.; 110 and 111.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
  2. Width: 3 inches.
  3. Thickness: 6.5 mils.
  4. Adhesion: 90 ounces force/inch in width.
  5. Elongation: 2 percent.
  6. Tensile Strength: 40 lbf/inch in width.
  7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

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- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
  - b. Compac Corp.; 130.
  - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
  - d. Venture Tape; 1506 CW NS.
2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
  - b. Compac Corp.; 120.
  - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
  - d. Venture Tape; 3520 CW.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

## 2.6 SECUREMENTS

- A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Childers Products; Bands.
  - b. PABCO Metals Corporation; Bands.
  - c. RPR Products, Inc.; Bands.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 1/2 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

- B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.



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- a. Products: Subject to compliance with requirements, provide one of the following:
  - 1) AGM Industries, Inc.; CWP-1.
  - 2) GEMCO; CD.
  - 3) Midwest Fasteners, Inc.; CD.
  - 4) Nelson Stud Welding; TPA, TPC, and TPS.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) AGM Industries, Inc.; CWP-1.
    - 2) GEMCO; Cupped Head Weld Pin.
    - 3) Midwest Fasteners, Inc.; Cupped Head.
    - 4) Nelson Stud Welding; CHP.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products: Subject to compliance with requirements, provide one of the following:
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
    - 2) GEMCO; Perforated Base.
    - 3) Midwest Fasteners, Inc.; Spindle.
  - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
    - 2) GEMCO; Press and Peel.
    - 3) Midwest Fasteners, Inc.; Self Stick.
  - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive-backed base with a peel-off protective cover.

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5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
  - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) AGM Industries, Inc.; RC-150.
    - 2) GEMCO; R-150.
    - 3) Midwest Fasteners, Inc.; WA-150.
    - 4) Nelson Stud Welding; Speed Clips.
  - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- D. Wire: 0.080-inch nickel-copper alloy.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. C & F Wire.
    - b. Childers Products.
    - c. PABCO Metals Corporation.
    - d. RPR Products, Inc.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F . Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

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- 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.

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2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
  - a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
  1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Manholes.
  5. Handholes.
  6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  1. Comply with requirements in Division 07 Section "Penetration Firestopping" Firestopping and fire-resistive joint sealers.

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

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2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:

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1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
  - a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

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1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Underground piping.
  2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/4 and Larger: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

- B. Domestic Hot and Recirculated Hot Water:

1. NPS 3/4 and Smaller: Insulation shall be one of the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1 and Larger: Insulation shall be the following:
  - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

#### **C. Storm Drainage Piping:**

1. **NPS 3 and Larger: Insulation shall be the following:**
  - a. **Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.**

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END OF SECTION 220700



***PART 1 - GENERAL***

***1.1 SUMMARY***

***A. Section Includes:***

- 1. Grease interceptors.***

***1.2 ACTION SUBMITTALS***

***A. Product Data: For each type of interceptor.***

***B. Shop Drawings: For each type and size of interceptor indicated.***

- 1. Include materials of construction, dimensions, rated capacities, retention capacities, location and size of each pipe connection, furnished specialties, and accessories.***

***1.3 INFORMATIONAL SUBMITTALS***

***A. Coordination Drawings: Interceptors, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:***

- 1. Piping connections. Include size, location, and elevation of each.***
- 2. Interface with underground structures and utility services.***

***1.4 CLOSEOUT SUBMITTALS***

***A. Operation and maintenance data.***

***1.5 FIELD CONDITIONS***

***A. Interruption of Existing Sewer Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sewer services according to requirements indicated:***

- 1. Notify Architect no fewer than seven days in advance of proposed interruption of service.***
- 2. Do not proceed with interruption of sewer services without Architect's written permission.***

**PART 2 - PRODUCTS**

**2.1 GREASE INTERCEPTORS (GI-1)**

*Seamless rotationally-molded polyethylene grease interceptor: Comply with ASME A112.14.3 and CSA B481.1. Grease capacity shall be 1,895 lbs. @ 100 GPM.*

1. *Standard: PDI G101 and ASME A112.14.3, for intercepting and retaining FOG from food preparation wastewater.*
2. *PDI Seal: Required.*
3. *Body Material: Seamless, rotationally-molded polyethylene.*
4. *Length by Width by Depth: 87" X 44".*
5. *Number of Compartments: One*
6. *Inlet and Outlet Pipe Size: 6"*
7. *Cleanout: Integral.*
8. *Mounting: flush with floor.*
9. *Flow-Control Fitting: Not Required.*

**B. Manufacturers:** *Subject to compliance with requirements, provide products by:*

1. *Schier Products Company.*
2. *Or approved equal.*

**PART 3 - EXECUTION**

**3.1 EARTHWORK**

- A.** *Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."*

**3.2 INSTALLATION**

- A.** *Install interceptor and components in accordance with manufacturer's instructions and approved product data submittals.*

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- B. Set interceptors level and plumb.*

### **3.3 PIPING CONNECTIONS**

- A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of pipings, fittings, and specialties.*
- B. Make piping connections between interceptors and piping systems.*

### **3.4 PROTECTION**

- A. Protect sanitary waste interceptors from damage during construction period.*
- B. Repair damage to adjacent materials caused by sanitary waste interceptor installation.*

**END OF SECTION 221323**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following storm drainage piping inside the building:
  - 1. Pipe, tube, and fittings.
  - 2. Special pipe fittings.
  - 3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:
  - 1. Storm Drainage Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

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2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

## 2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

## 2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
  1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
    - a. Available Manufacturers:
      - 1) ANACO.
      - 2) Clamp-All Corp.
      - 3) Ideal Div.; Stant Corp.
      - 4) Mission Rubber Co.
      - 5) Tyler Pipe; Soil Pipe Div.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

- A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

### 3.2 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, storm water piping NPS 4 and smaller shall be any of the following:
  1. ***Hubless cast-iron soil pipe and fittings, shielded, heavy duty stainless-steel couplings; and hubless-coupling joints.***
- C. Aboveground, storm water piping NPS 5 and larger shall be any of the following:

1. *Hubless cast-iron soil pipe and fittings and shielded heavy duty stainless-steel couplings; and hubless-coupling joints.*

D. Underground storm water piping NPS 4 and smaller shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

E. Underground storm water piping NPS 5 and larger shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

### 3.3 PIPING INSTALLATION

- A. Storm sewer and drainage piping outside the building are specified in Division 33 Section "Storm Utility Drainage Piping."
- B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Storm Drainage Piping Specialties."
- D. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- F. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.
- G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- H. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

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1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
- K. Install engineered controlled-flow storm drainage piping in locations indicated.
- L. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- N. Insulate all Horizontal Storm Water piping and Roof Drain sumps with a minimum of 1-inch-thick insulation. Insulation requirements are in Division 22 Section "Plumbing Insulation."***

### 3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
- C. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

### 3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- B. Shutoff Valves: Install shutoff valve on each sump pump discharge.
1. Install gate or full-port ball valve for piping NPS 2 and smaller.
  2. Install gate valve for piping NPS 2-1/2 and larger.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sump pump discharge.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  2. Individual, Straight, Horizontal Piping Runs: According to the following:

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- a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  2. NPS 3: 60 inches with 1/2-inch rod.
  3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  4. NPS 6: 60 inches with 3/4-inch rod.
  5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install supports for vertical steel piping every 15 feet.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.

### 3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.



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- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. 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 separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 5. Prepare reports for tests and required corrective action.

### 3.9 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

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SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Remote damper operators.
4. Fire dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Flexible ducts.
10. Duct accessory hardware.
11. Duct silencers.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

- A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
  - a. Special fittings.
  - b. Manual volume damper installations.
  - c. Control damper installations.
  - d. Wiring Diagrams: For power, signal, and control wiring.

- B. Performance Data for silencers:

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1. Silencer manufacturer to provide submittal drawings detailing all duct silencer data specified in the mechanical drawing schedule.
  2. The silencer manufacturer shall provide, for approval, acoustical system calculations for all duct systems with silencers to demonstrate that the submitted silencers will meet the required scheduled NC values in the occupied space. Use sound power levels of actual equipment to be installed on project. Analysis shall include breakout noise calculations.
  3. Supplier shall be responsible for the overall system pressure loss of the installation based on duct conditions upstream and downstream of the silencer to ensure required airflow is provided. Supplier shall submit detailed pressure drop analysis for the installation and detailed procedure outlining methodology for site measurement of overall system pressure loss for approval prior to manufacture.
    - a. Silencer internal design will provide ideal pressure drop value as scheduled
    - b. Installed pressure drop including system effect is maintained at maximum as scheduled.
  4. Acoustical and pressure drop calculations must be supplied with PE/P.Eng stamp at the time of submittal
- E. Source quality-control reports:
1. Silencer manufacturer to provide a copy of their laboratory NVLAP accreditation certificate for the ASTM E-477-06a test standard with the submittals. Data from non-NVLAP accredited test facilities will not be accepted.
- F. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- G. Source quality-control reports.
- H. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.
- C. Silencer performance must have been substantiated by laboratory testing in a duct-to-reverberant room test facility according to ASTM E477-06a. The test facility must provide for airflow in both directions through the test silencer. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption. The aero-acoustic laboratory must be currently NVLAP accredited for the ASTM E477-06a test standard.
- D. Silencer manufacturer shall provide a written test report by a third party organization showing silencer assemblies have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60.
  - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff Company
  - 3. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 1-inch wg.
- E. Frame: 0.052-inch thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:

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1. Material: Nonferrous metal.
2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
  1. Adjustment device to permit setting for varying differential static pressure.
  2. Counterweights and spring-assist kits for vertical airflow installations.
  3. Electric actuators.
  4. Chain pulls.
  5. Screen Mounting: Front mounted in sleeve.
    - a. Sleeve Thickness: 20-gage minimum.
    - b. Sleeve Length: 6 inches minimum.
  6. Screen Material: Galvanized steel.
  7. Screen Type: Insect.
  8. 90-degree stops.

## 2.3 MANUAL VOLUME DAMPERS

### A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. McGill AirFlow LLC.
  - b. Greenheck
  - c. Ruskin Company.
  - d. Pottorff Company
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
  - a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized-steel, 0.064 inch thick.

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6. Blade Axles: Nonferrous metal.
7. Bearings:
  - a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. McGill AirFlow LLC.
  - b. Greenheck
  - c. Pottorff Company
  - d. Ruskin Company.
2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
3. Suitable for horizontal or vertical applications.
4. Frames:
  - a. Hat shaped.
  - b. Galvanized-steel channels, 0.064 inch thick.
  - c. Mitered and welded corners.
  - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized, roll-formed steel, 0.064 inch thick.
6. Blade Axles: Nonferrous metal.
7. Bearings:
  - a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Blade Seals: Neoprene.
9. Jamb Seals: Cambered stainless steel.
10. Tie Bars and Brackets: Galvanized steel.
11. Accessories:
  - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

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## 2.4 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff.
  - 3. Ruskin Company.
- C. Description: Cable system designed for remote manual damper adjustment.
- D. Construction:
  - 1. Frame: 6" x minimum 22 gauge (152 mm x 0.85 mm), roll formed galvanized steel with reinforcing beads at each end.
  - 2. Blade: Round, minimum 22 gauge (0.85 mm), galvanized steel with center formed V for added rigidity. Flat blades are not acceptable.
  - 3. Axles: Minimum 3/8" (10 mm) square plated steel, mechanically attached to blade.
  - 4. Bearings: Molded synthetic, sleeve-type turning in tight sealing hole in frame.
  - 5. Mounting: Vertical and/or Horizontal
  - 6. Actuator: Remote cable controlled quadrant shall be factory installed to the damper, attached to a minimum 36 inch (914 mm) long flexible cable controlled, and controlled by a 3/16 inch (4.8 mm) allen hex-head drive with 15/16 inch (24 mm) round white finishing plug (suitable for painting) and integral side-mounting flange. The entire assembly shall be factory assembled and tested prior to shipment, field assembled systems are not acceptable.
  - 7. Finish: Mill galvanized.
- E. Accessories:
  - 1. Extended cable length as required.
  - 2. Hex-wrench.

## 2.5 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff.
  - 3. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 3 hours.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
  - 1. Minimum Thickness: 0.05 inch thick, as indicated, and of length to suit application.
  - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

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- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.024-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

## 2.6 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Nexus PDQ; Division of Shilco Holdings Inc.
  - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

## 2.7 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. SEMCO Incorporated.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- E. Vane Construction: Double wall.
- F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.



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2.8 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Greenheck Fan Corporation.
  - 3. McGill AirFlow LLC.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
  - 1. Door:
    - a. Double wall, rectangular.
    - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  - 3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
    - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.9 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Flame Gard, Inc.
  - 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.
- D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

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2.10 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. Ventfabrics, Inc.
  - 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd..
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: 24 oz./sq. yd..
  - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
  - 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
  - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.11 FLEXIBLE DUCTS

- A. *Manufacturers: Subject to compliance with requirements, provide products by one of the following:*
  - 1. *Quiet Flex; QAS Flex Duct*

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2. *Flexmaster U.S.A., Inc; Type 6M*
3. *Thermaflex M-KE.*

**B. *Insulated, Flexible Duct: UL 181, Class 1, Porus spun nylon acoustic core supported by helically wound, spring-galvanized steel wire; fibrous-glass insulation; metalized polyester vapor-barrier film with scrim reinforcement.***

1. *Pressure Rating: 4-inch wg positive.*
2. *Maximum Air Velocity: 4000 fpm.*
3. *Temperature Range: Minus 10 to plus 160 deg F.*
4. *Insulation R-value: Comply with ASHRAE/IESNA 90.1.*

**C. Flexible Duct Connectors:**

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

## 2.12 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## 2.13 DUCT SILENCERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Vibro-Acoustics.
  2. Alternate manufacturers must request and obtain written approval by the Engineer to bid the project at least 10 days prior to the bid due-date. As a condition of pre-approval, alternate manufacturers must submit to the Engineer a minimum of twenty (20) different HVAC silencer test reports. Each report shall be for a silencer tested in full accordance with the ASTM E-477-06a silencer test standard in an aero-acoustic test facility which is NVLAP accredited for the ASTM E-477-06a standard. Each test shall have been conducted within the last 12 month period. A copy of the laboratory's NVLAP accreditation certificate must be included with the submitted reports. Any changes to the specifications must be submitted and approved in writing by the Engineer at least 10 days prior to the bid due-date.
- B. General Requirements:
  1. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.
  2. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
  3. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in other sections are minimums. Material gauges shall be increased as

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- required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.
4. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted in Section G below, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
  5. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.
  6. Fire-Performance Characteristics: Silencer assemblies, including acoustic media fill, Vibar™ film liner, sealants, and acoustical spacer, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.
  7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Rectangular Silencers including models RD and RED: Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 22 gauge and 18 gauge respectively. Inner perforated metal liner: ASTM A 653/A 653M, G90 galvanized sheet steel, Gauge 26 and Gauge 22
- D. Principal Sound-Absorbing Mechanism:
1. Dissipative silencers:
    - a. Models RD, RED and EX-RD type with acoustic media. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.
- E. Media Protection:
1. Dissipative silencers, including models RD, RED and EX-RD: Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber.
- F. HTL Casings: Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, breakout noise calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Breakout noise calculations shall be based on the sound power levels of the specified equipment.
- G. Accessories:
1. Factory-installed end caps to prevent contamination during shipping.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. On both sides of duct coils.
  - 2. Upstream and downstream from duct filters.
  - 3. At outdoor-air intakes and mixed-air plenums.
  - 4. At drain pans and seals.
  - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
  - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  - 7. At each change in direction and at maximum 50-foot spacing.
  - 8. Upstream and downstream from turning vanes.
  - 9. Upstream or downstream from duct silencers.
  - 10. Control devices requiring inspection.
  - 11. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
  - 1. One-Hand or Inspection Access: 8 by 5 inches.
  - 2. Two-Hand Access: 12 by 6 inches.
  - 3. Head and Hand Access: 18 by 10 inches.

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4. Head and Shoulders Access: 21 by 14 inches.
  5. Body Access: 25 by 14 inches.
  6. Body plus Ladder Access: 25 by 17 inches.
- J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Connect supply diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- N. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- O. Install duct test holes where required for testing and balancing purposes.
- P. Provide remote damper operators where ever volume dampers are installed above an inaccessible hard ceiling.
- Q. Install silencer according to manufacturer's written installation instructions.

### 3.2 ADJUSTMENT, CALIBRATION, AND TESTING

- A. Description:
1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
  2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
  3. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
  4. Equipment and procedures used for calibration shall meet instrument manufacturer's recommendations.
  5. Provide diagnostic and test equipment for calibration and adjustment.
  6. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
  7. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
  8. If after-calibration-indicated performance cannot be achieved, replace out-of-tolerance instruments.
  9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

### 3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:

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1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.
6. Ensure duct silencers are installed with airflow arrows in direction

**END OF SECTION**

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SECTION 238127 – VARIABLE REFRIGERANT FLOW SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION AND GENERAL REQUIREMENTS

- A. Variable Refrigerant Flow (VRF) HVAC system shall be a variable capacity, direct expansion (DX) heat recovery and heat pump engineered system. The outdoor unit shall consist of one or more cabinet(s) connected through common refrigerant piping. Each system shall have single or multiple, inverter compressor(s). Each system shall be connected to multiple indoor units (ducted, non-ducted or combination thereof) through a common refrigerant piping and integrated system controls. Each indoor unit shall be controlled individually. Additionally heat recovery system shall be capable of simultaneous heating and cooling individual zone(s).
  - 1. Simultaneous Cooling and Heating VRF System: Heat recovery system shall be an air cooled, system consisting of one to three outdoor unit(s) connected to Heat Recovery (HRU) unit(s) and indoor unit(s). Multi-port heat recovery units shall allow simultaneous heating and cooling of individual zone(s).
- B. The manufacturer shall provide the services of a Factory Authorized Service Engineer to provide complete start-up supervision. The Manufacturer's Representative shall provide a minimum of 16-hours of BACnet integration assistance with the owner's building automation contractor.
- C. **System shall be provided with all integral devices as required to meet ASHRAE 15-2022 R-32 refrigerant mitigation requirements, including but not limited to, all refrigerant leak detection devices, automatic shutoff valves and controls.**

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, sequence of operations and electrical characteristics.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.



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1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Organization for Standardization (ISO).
- B. All electrical power wiring shall be installed in accordance with the National Electrical Code (NEC) and all applicable state and local building codes.
- C. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label and comply with UL 1995 Heat and Cooling Equipment Standard for Safety.
- D. All systems must be AHRI 1230 Certified and listed in the certified product directory.
- E. The VRF system shall be installed by a licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer's agent. If contractor is not licensed by VRF equipment manufacturer as an approved installer then contractor shall provide written proof of certification prior to the start of installation.

1.7 STORAGE AND HANDLING

- A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, lifted, etc. as suggested by the manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. For Compressor: Five year(s) from date of Substantial Completion.
    - b. For Parts: Two year(s) from date of Substantial Completion.
    - c. For Labor: Two year(s) from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Daikin VRF (Tim McGraw at TriState – 610-825-4770)

2.2 SIMULTANEOUS HEATING AND COOLING SYSTEM

- A. SYSTEM DESCRIPTION:
1. The variable capacity heat pump air conditioning system shall be a Daikin Variable Refrigerant Volume Series (heat or cool model) system as specified.
  2. The system shall consist of multiple evaporators using PID control, REFNET™ joints and headers, a two-pipe refrigeration distribution system and Daikin VRV® condenser unit.
  3. The condenser shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressors using **R-32** refrigerant.
  4. The condensing unit may connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control.
  5. The Daikin condensing unit shall be interconnected to indoor unit models **FXZA and FXMA** as noted on contract drawings, and shall range in capacity from 7,500 Btu/h to 96,000 Btu/h in accordance with Daikin's engineering data book detailing each available indoor unit.
  6. The indoor units shall be connected to the condensing unit utilizing Daikin's REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable for a variable refrigerant system.
  7. Operation of the system shall permit either cooling or heating of all of the indoor units simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Manager, an Intelligent Controller or a BMS interface.
  8. The RXYQ\_TA condensing unit model numbers and the associated number of connectable indoor units per RXYQ\_TA condensing unit is indicated in the following table. Each indoor unit or group of indoor units shall be independently controlled.
  9. Voltage Platform - Heat pump condensing units shall be available with a 208-230V/3ph/60Hz power supply.
  10. Advanced Zoning - A single system shall provide for up to 64 zones.
  11. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.
  12. VFD Inverter Control and Variable Refrigerant Temperature - Each condensing unit shall use high efficiency, variable speed all "inverter" compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.
  13. Indoor shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
  14. Configurator software - Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes.
  15. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.
  16. Autocharging - Each system shall have a refrigerant auto-charging function.
  17. Flexible Design –

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18. Systems shall be capable of up to 540ft (165m) [623 ft. (190m) equivalent] of linear piping between the condensing unit and furthest located indoor unit.
19. Systems shall be capable of up to 3,280ft (1,000m) total "one-way" piping in the piping network.
20. Systems shall have a vertical (height) separation of up to 295ft between the condensing unit and the indoor units.
21. Systems shall be capable of up to 295ft (90m) from the first REFNET™ / branch point.
22. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit nominal capacity.
23. Systems shall be capable of 98ft (30m) vertical separation between indoor units.
24. Condensing units shall be supported with a fan motor ESP up to 0.32" WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
25. Oil Return – Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle.
26. Simple wiring – Systems shall use 16/18 AWG, 2 wire, stranded, non-shielded and non-polarized daisy chain control wiring.
27. Space saving – Each system shall have a condensing unit module footprint no larger than 48-7/8" x 30-3/16" (1694mm x 1242mm x 767mm).
28. Advanced diagnostics – Systems shall include a self-diagnostic, auto-check function to detect a malfunction and display the type and location.
29. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.
30. Advanced controls – Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
31. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.
32. Low sound levels - Each system shall use indoor and condensing units with quiet operation as low as 27 dB(A).

### 2.3 COOLING OPERATION:

1. The operating range in cooling will be 23°F db ~ 122°F db (-5°Cdb ~ 50°Cdb).
2. Cooling mode indoor room temperature range will be 57-77°F WB (13.8 - 25°CWB).
3. Cooling operation may be extended down to 10°F DB when the system is designed with the following limitations:
4. The system must be a single module outdoor unit: RXYQ72/96/120/144/168TA.
5. The smallest capacity indoor unit connected to the system must be 12,000 Btu/h.
6. The system must run continuously in cooling operation with a minimum of 1.5 tons of indoor units in operation.
7. Heating Operation:
8. The operating range in heating will be -4°F WB – 60°F WB.
9. Heating mode indoor room temperature range will be 59°FDB - 80°F DB.

### 2.4 EQUIPMENT

#### A. Electrical:

1. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
3. The control wiring maximum lengths shall be as shown below:

	CONDENSER TO INDOOR UNIT	CONDENSER TO CENTRAL	INDOOR UNIT TO REMOTE CONTROL
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		CONTROLLER	
CONTROL WIRING LENGTH	6,560 ft (2,000 m)	3,280 ft (1,000 m)	1,640 ft (500 m)
WIRE TYPE	16/18 AWG, 2 wire, non-polarity, non-shielded, stranded		

B. Refrigerant Piping

- The system shall be capable of refrigerant piping up to 540ft (165m) actual or 623ft (190m) equivalent from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280ft (1,000m) of piping between the condensing and indoor units with 295ft (90m) maximum vertical difference, without any oil traps or additional components.
- REFNET™ piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance.
  - T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

C. PAINT/CORROSION RESISTANCE:

- Paint and corrosion resistance shall be at a minimum per the table below:

COMPONENT	VRV IV		
	BASE MATERIAL	SURFACE TREATMENT	COATING THICKNESS
			External & Internal Surface
EXTERNAL PANEL BASE	Galvanized steel	POLYESTER	≥1.5 mils
EXTERNAL FRONT PANEL	Galvanized steel	POLYESTER	≥1.5 mils
PILLAR	Galvanized steel	POLYESTER	≥1.5 mils
COMPRESSOR COVER	ASTM material	Resin Paint	≥0.78 mils
FIN GUARD	Iron wire	Resin Paint	≥0.79 mils
FAN GUARD AND DRUM	Polypropylene	No treatment required	N/A
FAN	Acrylonitrile - glass	No treatment required	N/A
FAN MOTOR FRAME	Resin	No treatment required	N/A
FAN MOTOR SHAFT	Carbon steel	No treatment required	N/A
FAN MOTOR SUPPORT	Galvanized steel	POLYESTER	≥1.5 mils
HEAT EXCHANGERS (FIN ONLY)	Aluminum	Polymer Anti-corrosion surface treatment	Salt Spray 1000 hours, blister rating 10
ELECTRICAL PARTS BOX	Hot-dip zinc-coated steel	No treatment required	N/A
ELECTRICAL PARTS BOARD	Glass cloth / Glass nonwoven cloth material	Insulation Varnish	No specific thickness
SCREWS	Carbon steel wire rods	High corrosion resistance treatment	≥0.28 mils

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## 2.5 OUTDOOR/CONDENSING UNIT

### A. GENERAL:

1. The condensing unit is designed specifically for use with VRV series components.
2. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls.
3. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant accumulator.
4. Liquid and suction lines must be individually insulated between the condensing and indoor units.
5. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
6. The connection ratio of indoor units to condensing unit shall be permitted up to 200% of nominal capacity.
7. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
8. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.
9. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
10. The unit shall incorporate an auto-charging feature to ensure optimum performance. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.
11. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
12. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
13. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
14. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
15. The condensing unit shall be capable of heating operation at 0°F (-18°C) dry bulb ambient temperature without additional low ambient controls or an auxiliary heat source.

### B. UNIT CABINET:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed galvanized steel panels coated with a baked enamel finish.

### C. FAN:

2. 1. The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
3. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
4. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 22,283 CFM dependent on model specified.
5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

### D. CONDENSER COIL:

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1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins shall be coated with an anti-corrosion hydrophilic blue coating as standard from factory with a salt spray test rating of 1000hr per ASTM test standards.
5. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for a drain pan heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.
  - a. An alternate manufacturer must provide a drain pan heater to enable adequate defrosting of the unit in defrost operation.
6. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. COMPRESSOR:

1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit.
  - a. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.
    - 1) Non –inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
2. The inverter driven compressors in the condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type” or “J-type”.
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type.
  - a. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 10% to 100%.
5. The compressor’s motor shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation.
9. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be manually activated to specifically address this condition for single module and manifolded systems.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours. When connected to a central control system sequential start is activated for all system on each DIII network.

2.6 BRANCH SELECTOR UNITS

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A. GENERAL:

1. The branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.
  - a. These selector boxes shall be factory assembled, wired, and piped.
  - b. These **BSF(4/6/8)A54AAVJ** branch controllers must be run tested at the factory.
  - c. These selector boxes must be mounted indoors.
  - d. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. UNIT CABINET

1. These units shall have a galvanized steel plate casing.
  - a. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
  - b. The cabinet shall contain one subcooling heat exchanger per branch.
  - c. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
  - d. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer. These sound levels must not exceed the values below.

C. REFRIGERANT VALVES:

1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
2. The refrigerant connections must be of the braze type.
3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.
4. Each circuit shall have at least one BSF branch selector box.
5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

D. CONDENSATE REMOVAL:

1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

E. ELECTRICAL:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.7 ROUND FLOW CEILING CASSETTE INDOOR UNIT

- A. General: Daikin indoor unit model FXFQ\_T shall be a round flow ceiling cassette fan coil unit, operable with **R-32** refrigerant, equipped with an electronic expansion valve, direct drive DC (ECM) type fan, for installation into the ceiling cavity equipped with an air panel grill. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. It shall be a round flow air distribution type, fresh white, impact resistant decoration panel, or optional self-cleaning filter panel. The supply air is distributed via four individually motorized louvers. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with

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Daikin remote control BRC1E72, BRC1E73, BRC2A71 and BRC1E52B7. The indoor units sound pressure shall range from 30 dB(A) to 45 dB(A) at High speed measured at 5 feet below the unit.

B. Indoor Unit:

1. The Daikin indoor unit FXMA shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The round flow supply air flow can be field modified to 23 different airflow patterns to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.
6. The indoor units shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump provides up to 33-1/2" of lift from bottom of unit to top of drain piping and has a built in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
9. The voltage range will be 253 volts maximum and 187 volts minimum.
10. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor.
11. Supplied air shall be directed automatically by four individually controlled louvers.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Four auto-adjusted louvers shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
4. Fresh air intake shall be possible by way of Daikin's optional fresh air intake kit.
5. A branch duct knockout shall exist for branch ducting of supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.08 to 0.16 HP.
3. The airflow rate shall be available in three manual settings.
4. The DC fan shall be able to automatically adjust the fan speed in 5 speeds based on the space load.
5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings to allow operation with the high efficiency air filter options.
6. The fan motor shall be thermally protected.

E. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.



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3. The coil shall be a 2, or 3-row cross fin copper evaporator coil with up to 21 FPI design completely factory tested.
  4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/4 inch outside diameter PVC.
  5. A condensate pan with antibacterial treatment shall be located under the coil.
  6. A thermistor will be located on the liquid and gas line.
- G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
  2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
  2. The unit shall be compatible with interfacing with a BMS system via future BACnet gateway.
  3. The unit shall be compatible with a future Daikin Intelligent Touch Manager advanced multi-zone controller.
- I. Accessories:
4. Air intake kit

## 2.8 CASSETTE UNIT

- B. Indoor Unit:
1. The Daikin indoor unit **FXZAAAVJU & FXFAAAVJU** shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
  2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
  3. Both refrigerant lines shall be fully insulated from the outdoor unit or nearest branch connection into the refrigerant network.
  4. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
  5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
  6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 24-13/16" of lift, measured from the drain outlet, and has a built in safety shutoff and alarm.
  7. The indoor units shall be equipped with a return air thermistor.
  8. The indoor unit will be powered with 208~230V/1-phase/60Hz.
  9. The voltage range will be 253 volts maximum and 187 volts minimum.
- C. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
  2. Three auto-swing positions shall be available to choose from via field setting.
  3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
  4. Fresh air intake shall be possible by way of direct duct installation to the side of the indoor unit cabinet.

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5. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- D. Decoration Panel:
  1. The **FXZAAAVJU & FXFAAAVJU** series shall be compatible with three optional decoration panels:
  2. VISTA Decoration panel – white (BYFQ60C3W1W).
    - a. The decoration panel shall be a four-way air distribution type and constructed of impact resistant polymer.
    - b. The decoration panel dimensions shall measure 24-7/16" x 24-7/16" and shall fit into a standard 2x2 ceiling grid with no overlap of adjacent tiles.
    - c. The four air discharge outlet louvers shall be independently motorized and controllable. Each louver shall have a visual indicator to easily identify the louver and simplify the airflow configuration.
    - d. The louver outlets shall be capable of closure to allow for 3-way and 2-way air distribution.
    - e. The decoration panel shall be a low profile design, extending 5/16" below the ceiling.
    - f. The decoration panel color shall be fresh white (Munsell N9.5).
- E. Fan:
  1. The fan shall be driven by a direct-drive DC motor with statically and dynamically balanced impeller and shall have three user-selectable speeds available: high, medium, and low.
  2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output of 50W.
  3. The airflow rate shall be available in high, medium, and low settings.
  4. When **FXZAAAVJU & FXFAAAVJU** is connected with either the BRC1E73 Navigation Remote Controller or the DCM601A71 I-Touch Manager, the Auto fan mode shall be selectable.
- F. Filter:
  1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
- G. Coil:
  1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  3. The coil shall be a 2-row cross fin copper evaporator coil with 22 FPI design completely factory tested.
  4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/32 inch outside diameter PVC.
  5. A condensate pan shall be located under the coil.
  6. A condensate pump with a 24-13/16" lift, measured from the drain outlet, shall be located below the coil in the condensate pan with a built in safety alarm.
  7. A thermistor will be located on the liquid and gas line.
- H. Electrical:
  1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
  2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- I. Control:

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1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

J. Accessories:

1. VISTA Decoration panel – white (BYFQ60C3W1W)
2. Direct fresh air intake kit (KDDQ44XA60).
3. Wired remote controller (BRC1E73)
4. Adaptor for wiring (KRP1C75)
5. Wiring adaptor for electrical appendices (KRP4A74)

2.8 CONCEALED CEILING DUCTED UNIT

- A. General: Daikin indoor unit FXMQ shall be a built-in ceiling concealed fan coil unit, operable with refrigerant **R-32**, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be connected to outdoor unit model REYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E72, BRC1E73 and BRC2A71. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening. The indoor units sound pressure shall range from 29 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.
- B. Performance: Each unit's performance is based on nominal operating conditions as indicated on equipment schedules.

Model Number	Cooling (Indoor 80°F DB / 67°F WB, Outdoor 95°F DB, 25 ft pipe length)	Heating (Indoor 47°F DB / 43°F WB, Outdoor 70°F DB, 25 ft pipe length)
<b>FXZA07AAVJU</b>	<b>7,500</b>	<b>8,500</b>
<b>FXZA09AAVJU</b>	<b>9,500</b>	<b>10,500</b>
<b>FXZA12AAVJU</b>	<b>12,000</b>	<b>13,500</b>
<b>FXZA15AAVJU</b>	<b>15,000</b>	<b>16,500</b>
<b>FXZA18AAVJU</b>	<b>18,000</b>	<b>20,000</b>

C. Indoor Unit:

1. The Daikin indoor unit FXMQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.

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4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet and has a built in safety shutoff and alarm.
  5. The indoor units shall be equipped with a return air thermistor.
  6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
  7. The voltage range will be 253 volts maximum and 187 volts minimum.
- D. Unit Cabinet:
1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
  2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- E. Fan:
1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
  2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.
  3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
  4. The airflow rate shall be available in three settings.
  5. The fan motor shall be thermally protected.
  6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
  7. Fan motor external static pressure range for nominal airflow:

Model Number	Fan ESP (in. WG)
<b>FXZA07AAVJU</b>	0.40 – 0.12
<b>FXZA09AAVJU</b>	0.40 – 0.12
<b>FXZA12AAVJU</b>	0.40 – 0.12
<b>FXZA15AAVJU</b>	0.80 – 0.20
<b>FXZA18AAVJU</b>	0.80 – 0.20

- F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  3. The coil shall be a 3 row cross fin copper evaporator coil with 15 fpi design completely factory tested.
  4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
  5. A condensate pan shall be located under the coil.
  6. A condensate pump with an 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
  7. A thermistor will be located on the liquid and gas line.
- G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
  2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

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2. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
- I. Accessories:
  1. Remote "in-room" sensor kit KRCS01-4B.
    - i. The Daikin wall mounted, hard wired remote sensor kit for when a NAV controller is not used or when the NAV controller is not located in the space that is being controlled. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).
  2. MERV 13 Filter kit. Can be configured for right or left access. Filters replaceable without tools.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Equipment Mounting:
  1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s).
- D. Install all controls and control wiring noted above and required for a complete fully correctly functioning VRF system. This to include time required for programming of the system to provide a system manufacturer sequence of operation to be submitted and approved by Engineer.

#### 3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized and factory-employed service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  1. Manufacturer's Field Service: Engage a factory-authorized and factory-employed service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized and factory-employed service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Manufacturer shall provide the services of a Factory Authorized Service Engineer to provide complete start-up supervision. The Manufacturer's Representative shall provide a minimum of 16-hours of BACnet integration assistance with the owner's building automation contractor.

3.4 DEMONSTRATION

- A. Engage a factory-authorized and factory-employed service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

**END OF SECTION**

SECTION 27 11 26 – COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
  - 1. Uninterruptible power supplies.
  - 2. Temperature and humidity sensors.
  - 3. Power cords.
  - 4. Power distribution units.
  - 5. Installation.
- B. Related Requirements
  - 1. Section 27 05 00 Common Work Results for Communications
  - 2. Section 27 21 29 Data Communications Switches
  - 3. Section 27 21 33 Data Communications Wireless Access Points
  - 4. Section 27 26 23 Network Programming and Integration Requirements
- C. Narrative: The design intent of this section is to provide protected electrical power at each of six telecommunications spaces (DFs)—one (1) MDF and five (5) IDFs—for indoor and outdoor WAPs, wired switches for twisted-pair copper connectivity with support for PoE, and other PoE-powered devices such as CCTV security cameras and VoIP handsets.

1.2 REFERENCES

- A. Abbreviations and Acronyms
  - 1. BoD: Basis of Design
  - 2. Cat: Category (cable)
  - 3. CCTV: Closed-Circuit Television
  - 4. DF: Data Frame
  - 5. EC: Electrical Contractor
  - 6. IDF: Intermediate Distribution Frame
  - 7. IP: Internet Protocol
  - 8. MDF: Main Distribution Frame
  - 9. PDU: Power Distribution Unit
  - 10. PoE: Power-over-Ethernet
  - ~~11. SSI: Security System Installer~~
  - 12. STP: Shielded Twisted Pair
  - 13. UPS: Uninterruptible Power Supply
  - 14. UTP: Unshielded Twisted Pair
  - 15. VoIP: Voice-over-IP
  - 16. WAP: Wireless Access Point

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**17. CI: CCTV Installer (Radius Systems)**

**B. Reference Standards**

1. NFPA 70 National Electrical Code
  - a. As amended and adopted by the AHJ, if applicable.
  - b. 2023 edition, otherwise.
2. TIA-568.0-E.1 Generic Telecommunications Cabling for Customer Premises
3. TIA-568.2-D.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard
4. TIA-569-E.1 Telecommunications Pathway and Spaces
5. TIA-607-D.1 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
6. TIA-862-C Structured Cabling Infrastructure Standard for Intelligent Building Systems
7. UL 308 Subject for Power Distribution Units, edition 1
8. UL 467 Grounding and Bonding Equipment, edition 11
9. UL 1778 Uninterruptible Power Systems, edition 5
10. UL 1989 Standard for Standby Batteries, edition 5
11. UL 2239 Hardware for the Support of Conduit, Tubing, and Cable, edition 2
12. UL 9990 Information and Communication Technology (ICT) Power Cables, edition 1
13. OSHA Standards - 29 CFR Sections 1910 and 1926
14. ANSI/NEMA 250-2020 Enclosures for Electrical Equipment (1,000 Volts Maximum)
15. ANSI/BICSI 001-2017 R22 Information and Communication Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities
16. ANSI/BICSI N1-2019 Installation Practices for the Installation of Telecommunications and ICT Cabling and Related Cabling Infrastructure

**1.3 ADMINISTRATIVE REQUIREMENTS**

**A. Coordination**

1. Coordinate final installation location and mounting requirements with EC and ~~SSI~~ CI.
2. Coordinate network programming and integration per section 27 26 23, including Ethernet patch panel uplink port assignments, identification, and labeling with Owner.

**B. Preinstallation Meetings:** Arrange preinstallation meeting at least 1 week prior to commencing work with all parties associated with trade or as requested by Engineer. Presided over by Contractor, include Engineer who may attend, Subcontractor performing work of this trade, Owner's representative, and EC.

**C. Sequencing**

1. Commence physical installation after EC has installed technology racks at MDF and IDF locations and electrical service is ready for use in the space.
2. Complete physical installation under this section prior to installation of switches per section 27 21 29 and wireless access points per section 27 21 33.
3. Commence network programming and integration per section 27 26 23 after sufficient network connectivity has been established to the TESD NOC.



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1.4 ACTION SUBMITTALS

- A. Product data: For each type of product.
- B. Shop Drawings:
  - 1. Rack elevations for each DF showing intended layout of UPS, PDU(s), transformer (if applicable), and sensor.

1.5 INFORMATIONAL SUBMITTALS

- A. Test and Evaluation Reports:
  - 1. For each UPS, submit results of a comprehensive self-test following installation.
  - 2. For each DF, submit digital photographs showing the completed work, including: a full view of the rack from the front, close-up views of each component installed under this section, and side or rear views as access permits.
- B. Manufacturer Reports: For each UPS, submit factory test report.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Contracts: For each UPS.
- B. Warranty Documentation: For each product type.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. UPS: Double-conversion on-line pure sine rackmount; network management compatible with existing TESD network management software system. Provide (1) **3000VA** UPS per telecommunications rack at each DF. ~~Coordinate final UPS capacity and quantity with EC.~~
  - 1. Products:
    - a. APC Smart-UPS SRT 3000VA RM 208V (SRT3000RMXLT-NC)
    - ~~b. APC Smart-UPS SRT 5000VA RM 208V (SRT5KRMXLT)~~
  - 2. BoD quantity and sizing:
    - a. MDF: (2) 3000VA
    - b. IDF 1A: (1) 3000VA
    - c. IDF 2A: (1) 3000VA
    - d. IDF 2B: (1) 3000VA
    - e. IDF 3A: (1) 3000VA
    - f. IDF 3B: (1) 3000VA
- B. Transformer: Provide (1) step-down transformer per telecommunications rack at each DF.
  - 1. Products: APC Smart-UPS RT Tower Isolation/Step-Down Transformer (SURT003)

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## 2.2 ACCESSORIES

- A. Temperature and humidity sensor: Provide (1) at each DF.
  - 1. Products: APC Temperature & Humidity Sensor (AP9335TH)
- B. Power cords
  - 1. Products: Provide compatible units in required quantities at each DF.
    - a. Power Cord, Locking C19 to L6-20P, 3.0m (AP8753)
- C. PDU:
  - 1. Products: Provide compatible units in required quantities at each DF.
    - a. Rack PDU, basic, 0U/1U, 100-240V/20A, 220-240V/16A, (13) C13 (AP6020A)

## 2.3 MISCELLANEOUS MATERIALS

- A. Ethernet patch cables: Cat 6 or Cat 6A, STP, solid conductor, strain relief/anti-snag boot.
  - 1. Select cable lengths that are no greater than necessary for each connection while allowing sufficient working slack and respecting strain relief and bend radius limits.
- B. Fasteners, brackets, rails, tape, ties, wraps, labels, and other miscellaneous hardware and supplies as necessary are the responsibility of the Contractor.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Visit site prior to finalizing installation details such as accessories, installation methods, and miscellaneous materials. Verify in the field the exact locations of existing infrastructure and equipment, mounting surfaces and attachment points, supports, dimensions, access, clearance, and electrical service.

### 3.2 PREPARATION

- A. Cleanliness: Remove dust and debris from the work area prior to removing products from original packaging.

### 3.3 INSTALLATION

- A. Install/mount equipment securely according to manufacturer's instructions, applicable reference standards, and approved shop drawings.
  - 1. Connect sensor to UPS.
  - 2. Connect power cords and PDUs to UPS.
  - 3. Connect step-down transformer to UPS.
  - 4. Connect network management Ethernet patch cable to UPS, coiled neatly and secured.

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- B. Dress in all cabling using rack members and horizontal and vertical cable management as available.
  - 1. Avoid routing cables via rack members and faces that would create an obstruction for the installation of other equipment.
  - 2. Take up slack in data communications and sensor cable with figure-eight coils. Avoid violating minimum bend radii limits.
  - 3. Take up slack in electrical cables with figure-eight coils or flat Z-folds.
- C. Secure data communications and sensor cable with hook-and-loop wraps.
- D. Secure electrical cables with zip ties. Trim the excess tie leader flush with the ratchet.
- E. Apply identification labels to equipment and cables.

### 3.4 FIELD QUALITY CONTROL

- A. Acceptance testing:
  - 1. Energize the UPS, verify correct start-up and absence of any fault indications.
  - 2. For each downstream PDU, verify that the PDU is energized.
  - 3. Apply a load of at least 100W that affords immediate indication when energized and deenergized (provided by Contractor), disconnect service for 3 minutes, and verify successful transfer to and from battery.
- B. Capture the photographs required by Paragraph 1.5A.2 on the same day the installation is completed at each DF.

### 3.5 CLEANING

- A. Cleanliness: Remove dust and debris from the work area. Remove packaging. Deliver unused parts to the NOC.

END OF SECTION