SHIREMANSTOWN BOROUGH COUNCIL

SHIREMANSTOWN BOROUGH STORAGE AND MAINTENANCE BUILDING

Section 6

Contract 15609.655-2

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SHIREMANSTOWN BOROUGH STORAGE AND MAINTENANCE BUILDING
MECHANICAL - Contract 15609.655-2

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A. GENERAL

1. Scope of Project

a. Location

The Project is a new municipal storage and maintenance building for the Owner (Shiremanstown Borough) located along East Strawberry Alley, adjacent to the municipal building on 1 Park Lane in Shiremanstown Borough, Cumberland County, Pennsylvania in accordance with the Contract Documents.

b. Scope

It is the intent of the drawings and specifications to describe the construction of the municipal garage to be performed under separate prime contracts (the "Prime Contracts") as described below. Each Prime Contractor shall furnish all labor, materials, equipment, machinery, apparatus and tools and perform all operations necessary to install, equip and put into satisfactory operation the Work specified and shown on the Plans.

Any labor, materials, equipment, or apparatus not specifically mentioned in the plans or specifications which may be necessary for the proper completion of the entire Work shall be furnished by each Prime Contractor without additional compensation.

c. Contract Documents

The Contract Documents as defined in the Standard Contract Provisions which are made a part hereof. In the event of any inconsistency, the provisions of this Division I shall control.

d. Starting and Completing Work

The Contract work shall be started immediately upon receipt of a written notice from the Owner and shall be continued in full force until completion, unless approval to suspend work is granted by the Owner or unless delays occur due to unfavorable weather.

Before filing his bid, the Bidder shall have made all arrangements to be fully equipped to expeditiously carry on all work in case he is awarded a Contract and shall have made all arrangements to permit immediate transportation to the site of the work of all equipment, materials and other facilities required to execute the work.

In scheduling his operations, the Contractor shall take into consideration all delays that may occur due to unfavorable weather; failure of public utilities or others to install, remove or adjust their structures when required; and the uncertainties prevailing on account of a national emergency in regard to obtaining critical materials and labor to complete the various portions of such work in time.

e. Release of Lien

The Contractor shall provide to the Shiremanstown Borough Council a Release of Lien in a format acceptable to the Borough and properly signed by al tradesmen or suppliers which provided either materials or labor for the work performed under this contract. This Release of Lien shall be presented to the Shiremanstown Borough at the time of application for final payment.

2. Summary

a. This Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.

b. Specific requirements of each contract are also indicated in individual Specification Sections and on Drawings.

c. Related Sections include the following:

1) Section 2- Work Restrictions: Use of the Project site and for requirements for continued Owner occupancy of premises.

2) Section 3 - Submittal and Testing Procedures.

3. Definitions

a. Permanent Enclosure

As determined by Architect/Engineer, permanent or temporary roofing, which is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

4. Prime Contracts

a. Prime contracts for Project include the following:

Contract 1 – General Construction (Contract 15609.655-1)
Contract 2 – Mechanical Construction (Contract 15609.655-2)
Contract 3 – Electrical Construction (Contract 15609.655-3)
Contract 4 – Plumbing Construction (Contract 15609.655-4)

5. Coordination

a. Project Coordinator shall be responsible for coordination among all Prime Contractors.

1) General Construction Contractor ("General Contractor") shall act as the Project Coordinator.

b. General Contractor

1) The General Contractor shall have coordination responsibility of all and each prime contractors. This shall include:

a) Providing a master project schedule ("Master Project Schedule") which includes each separate Prime Contractor's scheduled responsibilities for delivery dates, installation, construction and critical activities for the Project.

b) Direct, schedule and control onsite activities of each separate Prime Contractor.

c) Provide specific directions to each Prime Contractor when unforeseen interferences impact the progress of the work.

2) The General Contractor shall be experienced in administration and supervision of building construction, including the scheduling and coordination of plumbing, HVAC and electrical work.

3) The coordination activities of the General Contractor include, but are not limited to, the following:

a. Provide overall coordination of the Work.

b. Coordinate shared access to workspaces.

c. Coordinate product selections for compatibility.

d. Provide overall coordination of temporary facilities and controls.

e. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.

f. Coordinate construction and operations of the Work with work performed by each contract.

g. Prepare Coordination Drawings (if and as required) to coordinate work by more than one contract.

h. Coordinate sequencing and scheduling of the Work.

j. Provide quality-assurance and quality-control services.

k. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections with the testing laboratory.

l. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.

m. Set elevations provided by the Engineer. The General Contractor shall also be responsible for setting all corners, batterboards, off-set stakes and other construction lines from property lines or other reference points provided by the Engineer.

n. Provide waste collection and progress cleaning of common areas and coordinate waste collection, recycling and progress cleaning of areas or pieces of equipment where more than one contractor has worked.

o. Coordinate cutting and patching of all the Work.

p. Coordinate protection of the Work.

q. Coordinate preparation of Project Record Documents; all information from all contractors is to be integrated to form one combined record set.

r. Print and submit Record CAD Drawings if installations by more than one contractor are indicated on the same Contract Drawing or Shop Drawing.

s. Collect Record Specification Sections from other contractors, collate Sections into numeric order, and submit one complete set.

t. Coordinate preparation of operation and maintenance manuals; all information from all contractors is to be integrated to form one combined record set.

c. Prime Contractors

1) Each Prime Contractor shall be responsible to the General Contractor to coordinate that Prime Contractor's onsite activities. This includes submission of detailed information relating to the scheduling activities of material procurement, delivery dates, installation timeframes and notification of required work to be completed by other Prime Contractors prior to the installation of each Prime Contractor's work.

2) All onsite interferences with other trades shall be coordinated with the General Contractor. Unforeseen conditions that may arise and necessitate a Construction Change Directive shall be conveyed to the Engineer but shall be coordinated with the General Contractor.

3) The General Contractor shall be experienced in administration and supervision of building of building construction, including the scheduling and coordination of mechanical, plumbing and electrical work.

6. Schedules

a. Pre-Award Information

The apparent low bidder for each Prime Contract shall, within ten (10) working days following notification of its status as apparent low bidder, provide the Engineer with an intended schedule for work to be completed. The Engineer shall transmit the information to the apparent General Contractor low bidder.

b. Master Project Schedule

Within ten (10) working days following receipt of the information set forth in subsection a. above, the apparent low bidder for the General Construction Contract shall provide the Engineer with a Master Project Schedule which incorporates the schedules of the other Prime Contractors and which Master Project Schedule shall be controlling on all of the Prime Contractors thereafter.

Upon receipt, the Engineer shall provide a copy of the Master Project Schedule to each Prime Contractor along with the Notice of Award. No changes or deviations from the Master Project Schedule shall be permitted without approval from the Engineer and, if the change or deviation involves an extension in the time for completing the required Work, a written change order or directive as the case may be.

c. Form of Schedule

The Master Project Schedule shall be a critical path schedule in such form as is approved by the Engineer.

d. Failure to adhere to the Master Project Schedule by any Prime Contractor shall be considered a default of that Prime Contractor.

7. All Prime Contracts

a. Extent of Contract

Unless the Contract Documents contain a more specific description of the Work, names and terminology on Drawings and in Specification Sections determine which contract includes a specific element of Project.

1) All Work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.

2) Local custom and trade-union jurisdictional settlements do not control the scope of the Work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruption and delays.

3) Trenches for the Work of each contract shall be coordinated with and provided by the General Contractor unless otherwise specified (electrical service). See General Contractor specification for trenching specifications.

4) Selective demolition for the work of each contract shall be coordinated with the General Contractor and shall be provided by each Prime Contractor for its own work.

5) Cutting and patching for the Work of each contract shall be coordinated with the General Contractor and shall be provided by each Prime Contractor for its own Work.

6) Firestopping for the Work of each contract shall be coordinated with the General Contractor and shall be provided by each Prime Contractor for its own Work.

b. Substitutions

Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the Work.

c. Temporary Facilities and Controls

Each Prime Contractor is responsible as follows:

1) Access to the Construction Site

Access for all Prime Contractors to the Project site is the responsibility of the General Contractor, which shall construct and maintain temporary roads as necessary. Temporary roads shall be adequate to permit the entrance and egress of construction and supply vehicles of all contractors at all times during the construction period. No contractor/worker, or any subcontractor or supplier shall be permitted to use the existing driveways or any portion of the existing parking facilities without the approval of the Engineer.

2) Temporary Services

Each Prime Contractor is specifically responsible for the installation, operations, maintenance and removal of each temporary service or facility, usually recognized as related to that contractor's normal scope of work.

3) Use/Utility Charges

a) General

All utility charges for temporary facilities shall be paid for by the General Contractor. The Owner will not assume responsibility for any utility costs until the Certificate of Completion has been issued for the Project. Use charges (i.e., tapping fees, 3∅ power) will be paid by the Owner.

b) Sanitary Sewer Service

There shall be no discharge into the existing sanitary sewer system without prior written authorization by the Borough Engineer.

c) Water Service

Cost of all metered water service used by each Prime Contractor shall be the responsibility of the General Contractor.

For Shiremanstown Borough facility construction, water can be provided by the Borough from the existing service line at the Borough Office for low volume service, at the discretion of the Borough. Borough reserves the right to halt provision of water at its discretion.

d) Electrical Power Service

The cost for all temporary electric power service at the Project Site by all Prime Contractors shall be the responsibility of the General Contractor.

For Shiremanstown Borough facility construction, electricity can be provided by the Borough from the existing service line at the Borough building or alternate location for general service, at the discretion of the Borough. Borough reserves the right to halt provision of electricity at its discretion.

e) Utility Extensions

The cost of extending utilities to and on the Project Site shall be as is otherwise set forth in the plans and specifications.

f) Security and Protection Facilities

The General Contractor shall be responsible for installing temporary enclosures around partially completed areas of construction and provide lockable entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security. Each Prime Contractor shall be responsible for securing that contractor's own equipment and materials. In the event of loss, the Owner shall not be responsible. Each Prime Contractor shall be responsible to secure the Project work area at the end of each workday.

d. Right of Property

No Prime Contractor shall have any right in any property or materials taken from any excavation and no earth, sand or other material from the Site shall be removed before any fill operations, except with the approval of the Engineer. The provisions of this paragraph shall not be construed to relieve any Prime Contractor of any of its obligations to remove and dispose of any excavated material with or without re-handling at its cost and expense as otherwise provided in the specifications.

e. Concrete Mix Computations

In addition to the requirements of the specification "Concrete Construction," the Contractor shall employ a testing laboratory to prepare computations of the concrete mixes to be used, and submit the computations to the Engineer for approval. Such approval will not relieve the Contractor of responsibility of the mixes.

f. Minimum Wage Rates

The applicable Pennsylvania prevailing wage determination for this Project are attached to the Contract Documents and shall be complied with in accordance with the instructions to bidders.

g. Painting Work by Others

All pipe, conduit, equipment installed under the Electrical Prime Contract (Contract 15609.655-3) shall be painted by the General Contractor (Contract 15609.655-1). Colors shall be as directed by the Engineer.

h. Safety and Health Regulations

Each Prime Contractor shall comply with the Department of Labor, Safety and Health Administration Regulations for construction promulgated under the Occupational, Safety and Health Act of 1970 (P.L. 91-596) and under Section 107 of the Contract Hours and Safety Act (P.L. 91-54).

i. Miscellaneous

1) Vehicle Removal and Barricades

Removal of vehicles, barricading and other operations necessary for the completion of the required work for each Prime Contractor is the responsibility of that Contractor.

2) Designated Representative

Each Prime Contractor shall provide at least one responsible worker to answer emergency calls on a 24-hour basis and perform emergency service during non-working hours for any condition resulting from that Prime Contractor's construction activities which may present a hazard to the Project or to the public. This worker shall make himself available at any time of the day or night and any day of the week for any required emergency work and shall have available a proper vehicle, supplies and materials together with such authority as is required from the Prime Contractor to adequately perform his duties hereunder. If a contractor is notified of a deficiency which is not corrected within two hours from the time of notification, then the Owner may initiate repairs and the responsible Prime Contractor will be back charged.

3) Changes in the Project

Any changes in the Project which involve cost adjustments shall be only in accordance with the change order procedures otherwise set forth in the General Conditions.

4) Payments

Payments to each Prime Contractor shall be in accordance with payment applications as otherwise set forth in the general conditions and shall be in accordance with a lump sum contract price.

5) Time for Completion and Liquidated Damages

The responsibility to perform the Work for each Prime Contract shall commence upon receipt of a Notice to Proceed from the Engineer and shall continue in full force until completion which shall be within **180 (one hundred eighty) calendar days** from the date of receipt of the Notice to Proceed from each Prime Contract. No delays will be permitted unless a change order granting an extension of time is issued and approved by the Owner.

The parties recognize that the Owner will incur damages if the Project is not completed within the 180 day time period, and also recognize that these damages shall be difficult to ascertain or quantify. After reasonable investigation and consideration, and by executing the Contract, each Prime Contractor agree that **$1000 per day** is a best effort estimate for damages resulting from delay in completion to the Owner. The Prime Contractors also agree that any damages resulting from failure to perform and complete the Work under each Prime Contract shall result in additional damages as are otherwise permitted to the Owner under applicable Pennsylvania law and which shall include additional engineering fees, inspection work and any other damages which are properly recoverable.

6) Insurance

Each Prime Contractor shall provide evidence of coverage of insurances as required under the General Conditions.

7) Indemnification

Each Prime Contractor shall indemnify and hold harmless the Owner, the Engineer and their respective agents and employees from and against all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from the performance of that Prime Contractor's Work, providing that any such claim, damage, loss or expense is:

a) attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property including the loss of use resulting therefrom.

b) caused in whole or in part by any intentional or negligent act or omission of a Prime Contractor, its employees, subcontractors, suppliers or materialmen or anyone directly or indirectly employed by any of them or anyone for whose acts may be liable, regardless of whether or not it is caused in part by anyone indemnified hereunder.

c) in any and all claims against the Owner or any of its agents or employees by any employee of any Prime Contractor, any subcontractor, supplier or materialmen of any of them, the indemnification obligation under this section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor under workman's compensation acts, disability acts or other employee's benefit acts.

8) Release of Liens

All Contractors shall provide Owner a release of liens properly signed by all tradesmen, suppliers, subcontractors and subcontractors of subcontractors or anyone who has provided materials or labor for the Work performed under any Prime Contract. The release of liens shall be presented to the Engineer prior to the payment of the final retainage for any Prime Contractor's entitlement.

9) Operation and Maintenance Manuals

Each Prime Contractor shall collect two sets of catalog data including instructions for operations and care of all equipment, diagram, drawings, etc. for all pieces of equipment furnished under that Prime Contractor's

contract. The data shall be submitted to the General Contractor who shall reduce it into a single notebook form and suitably indexed. In addition to the data provided herein, the information contained shall include any and all manufacturer or supplier warranties which are issued pursuant to the required Work under the Contract. The General Contractor shall cause the same to be delivered to the Engineer prior to the release of final payment. This record shall also include the plan location and elevation of all underground piping and utilities and shall include "as built" buildings.

8. General Construction Contract

a. Work in the General Construction Contract includes, but is not limited to, the following:

1) Site preparation, including cleaning and relocations and earthwork.

2) Site improvements, including site development furnishings and equipment and seeding/restoration.

3) Stormwater inlets, piping, stone and all components to install the required stormwater management system.

4) Sanitary sewer lateral from oil/water separator to existing lateral.

5) Water supply lateral from existing supply to new building.

6) Oil-Water Separator and installation.

7) Tunnels and trenching for site utilities.

8) Foundations, including footings, foundation walls.

9) Slabs-on-grade, including earthwork, subdrainage systems, and insulation.

10) Paving and concrete as depicted on the plan for the site.

11) Permanent Signs installation (signs provided by Borough).

12) Concrete Bollards, Wheel Stops, and Concrete Bin Blocks and installation

13) Below-grade building construction, including excavation, backfill, and thermal and moisture protection.

14) Superstructure, including floor mezzanine and roof construction.

15) Exterior closure, including walls, parapets, doors, windows and louvers.

16) Roofing, including coverings, flashings, roof specialties and openings.

17) Interior construction, including partitions, doors, interior windows, and fittings.

18) Interior finishes.

19) Furnishings, including casework (no furniture or appliances).

b. Temporary facilities and controls in the General Construction Contract include, but are not limited to, the following:

1) Temporary facilities and controls that are not otherwise specifically assigned to the Plumbing Contract, HVAC/Mechanical Contract or Electrical Contract.

2) Unpiped sewers and drainage, including drainage ditches, dry wells, stabilization ponds, and containers. There shall be no discharge into the sanitary sewer system without prior written authorization by the Owner.

3) Stormwater control, including the following:
   a. Erosion and sediment controls
   b. Foundation drainage system.
   c. Site drainage system.

4) Unpiped portable or temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.

5) Temporary enclosure for building exterior, except as indicated.

6) Dewatering facilities and drains.

7) General hoisting facilities for materials and personnel, up to 2 tons (2000 kg).

8) Project identification and temporary signs as shall be designed and paid for by the General Construction Contractor.

9) General waste recycling and disposal facilities.

10) Temporary fire-protection equipment.

11) Security enclosure and lockup.

12) Traffic Control

13) Environmental protection.

14) Restoration of Owner's existing facilities used as temporary facilities.

15) Soil stabilization; sedimentation and erosion control.

c. Miscellaneous

1) The General Contractor shall be responsible for determining the exact location of all utilities on the site and shall protect the utilities during the course of the work performed by all Prime Contractors. Notwithstanding, each Prime Contractor, shall at the discretion of the utility involved, repair or have repaired all damage to any utility which the result of the work of that Prime Contractor at no cost to the Owner. In the event that any utilities interfere with the installation of new building or appurtenances, each Prime Contractor must allow for such interference in his bid. Each Prime Contractor is required to comply with all provisions of Act 287 of the Commonwealth of Pennsylvania effective April 9, 1975. The cost of any required utility location shall be included in the General Contractor's lump sum bid on the proposal form.

2) Safety of the General Public. The General Contractor shall be responsible for the safety of the general public in or about the site at all times. All excavated areas shall be backfilled daily or roped off with lighted barricading.

3) The General Contractor is responsible for the obtaining of all necessary permits (i.e., building permit, excavation permit, etc.) from Shiremanstown Borough, Cumberland County or any governmental body having legal jurisdiction over the same. The cost of all permits shall be included in the bid price of the General Contractor.

9. Plumbing Contract

a. Work in the Plumbing Contract includes, but is not limited to, the following:

1) Site water supply and distribution.

2) Site sanitary sewer, including oil/water separator.

3) External and internal trench drains up to storm sewer system and oil/water separator on sanitary sewer.

4) Site gas line service connection

5) Site special plumbing systems.

6) Plumbing fixtures.

7) Domestic water distribution.

8) Sanitary waste.

9) Plumbing connections to equipment furnished by the General Construction Contract, Plumbing Contract, HVAC/Mechanical Contract and Electrical Contract.

b. Temporary facilities and controls in the Plumbing Contract include, but are not limited to, the following:

1) Piped water service.

2) Piped temporary toilet fixtures, wash facilities, and drinking water facilities.

3) Plumbing connections to existing systems and temporary facilities and controls furnished by the General Construction Contract, Plumbing Contract, HVAC/ Mechanical Contract and Electrical Contract.

10. HVAC/Mechanical Contract

a. Work in the HVAC/Mechanical Contract includes, but is not limited to, the following:

1) Heat generation.

2) Refrigeration.

3) HVAC distribution.

4) Terminal and packaged units.

5) HVAC instrumentation and controls.

6) HVAC testing, adjusting, and balancing.

7) Mechanical connections to equipment furnished by the General Construction Contract, Plumbing Contract, HVAC/Mechanical Contract and Electrical Contract.

b. Temporary facilities and controls in the Mechanical Contract include, but are not limited to, the following:

1) Temporary heat and ventilation.

11. Electrical Contract

a. Work in the Electrical Contract includes, but is not limited to, the following:

1) Site electrical distribution (See site drawings).

2) Site lighting.

3) Electrical service and distribution.

4) Lighting and branch wiring.

5) Telecommunications, security, computer wiring and audio-visual wiring. Equipment will be supplied by others.

8) Electrical connections to equipment furnished by the General Construction Contract, Plumbing Contract, HVAC/Mechanical Contract and Electrical Contract.

b. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following:

1) Electric power service and distribution.

2) Lighting, including site lighting.

3) Electrical connections to existing systems and temporary facilities and controls furnished by the General Construction Contract, Plumbing Contract, HVAC/ Mechanical Contract and Electrical Contract.

12. Separate Contracts

Any additional separate contracts will be secured by the Owner. Coordinate work prior to completion of rooms and final work. The following work will be provided by the Owner.

a. Telephone and Data System Equipment
b. Security System Equipment
c. Furniture

13. Progress of the Work

a. All scheduling and sequencing of the Construction Work shall be coordinated with the Owner.

b. It is essential that the Contractors communicate on this job. A list of Contractors will be supplied by the Engineer prior to the start of work. The Contractors are directed to check on the progress of each contract to maintain a smooth flow of trades through the duration of the project. The General Construction Contractor (Contract 15609.655-1) shall act as the project coordinator. The Owner and Engineer will not be responsible for changes or rework necessary due to lack of coordination between Contractors.

Upon award of the project, the General Contractor (Contract 15609.655-1) shall arrange and conduct a sequencing and scheduling meeting with all contracts. Prior to construction, a master project schedule shall be submitted to the Borough for review and approval.

14. Subsurface Conditions

From investigations, including surveys made at the site, it is assumed that physical conditions are approximate, as indicated on the drawings, but the nature of the materials below the surface or the depth to satisfactory foundations, are not guaranteed. No additional compensation shall be paid for rock or any other subsurface condition. The Contractors expressly assumes the risk of any unexpected subsurface condition. No boring has been performed.

15. Non-Classified Excavation

All excavation shall be unclassified. The Contractors are hereby advised that where rock is encountered within the lines and grades shown on the drawings or described by the specifications for lump sum items on the contract proposal, removal of same will be paid for as a part of the applicable lump sum price bid and no extra compensation will be made therefore.

16. Project Photographs

Prior to construction, the General Contractor shall furnish three (3) sets of photographs of the site from four (4) views. During construction, the Contractor shall provide three (3) sets of detailed project photographs each month during construction. Copies of the photographs shall be supplied to the Engineer with pay applications.

17. Cleaning

a. General

1) Description

a) Throughout the construction period, maintain the renovation area in a standard of cleanliness as described in this Section.

b) Owner requires that this project generate the least amount of trash and waste possible. All Contractors shall comply with Section 017419 Construction Waste Management and Disposal.

2) Quality Assurance

c) Conduct daily inspections and more often, if necessary, to verify that requirements for cleanliness are being met.

d) In addition to the standards described in this Section, comply with pertinent requirements of governmental agencies having jurisdiction.

b. Products

1) Cleaning Materials and Equipment

Provide required personnel, equipment and materials needed to maintain the specified standard of cleanliness for a clean and neat site.

2) Compatibility

Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

c. Execution

1) Progress Cleaning

a) General

(1) Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic and providing required protection of materials.

(2) Do not allow accumulation of scrap, debris, waste material and other items not required for construction of this work.

(3) At least once each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.

(4) Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the environment.

b) Building

(1) At the end of each day's work, inspect the building and pick up all scrap, debris and waste material. Remove such items to the place designated for their storage.

(2) At the end of each day's work, sweep interior spaces clean; free from dust and other material capable of being removed by use of reasonable effort and a handheld broom.

(3) As required preparatory to installation of succeeding materials, clean the building or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.

(4) Following the installation of finish floor materials, the finish floor shall be kept clean and protected at all times while work is being performed in the space in which finish materials are installed; free from foreign material which may be injurious to the finish floor material.

2) Final Cleaning

a) Final cleaning shall be provided by skilled cleaners using commercial quality building maintenance equipment and materials.

b) Prior to completion of the work, remove from the buildings job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Article C.1 above.

c) Building

(1) Exterior

(a) Remove all traces of soil, waste materials, smudges and other foreign matter from exterior surfaces.

b) In the event of stubborn stains not removable with water, the Architect may require other additional cleaning at no additional cost to the Owner.

(2) Interior

(a) Remove all traces of soil, waste materials, smudges and other foreign matter from interior surfaces.

(b) Remove all traces of splashed material from adjacent surfaces.

(c) Remove paint droppings, spots, stains and dirt from finished surfaces.

(3) Polished Surfaces

To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

d) Schedule final cleaning as approved by the Engineer to enable the Owner to accept a completely clean facility.

e) Final acceptance of the building is contingent on approval of final cleaning.

3) Cleaning During Partial Occupancy

Should the Owner occupy the work of any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Engineer.

B. UTILITIES

The Contractor shall determine the exact location of all utilities affected by this work and shall protect the utilities during the course of the work. The Contractor shall, at the discretion of the utility involved, repair or have repaired all damage to the utilities, which is a result of the work, at no cost to the Owner. These utilities may interfere with the installation of the new lines or appurtenances and the Contractor must allow for such interference in his bid. The Contractor will be required to comply with all provisions of Act 287 of the Commonwealth of Pennsylvania, effective April 9, 1975. The cost of utility location shall be included in the Contractor's lump sum bid on the Proposal Form.

C. SAFETY OF GENERAL PUBLIC

The Contractor shall be responsible for the safety of the general public in or about the project site at all times. Excavated areas shall be backfilled daily or roped off with lighted barricading. Entrances to driveways and adjoining residents shall have sound steel plating or wood planking of uniform thickness, with handrails and adequate lighting across excavated areas to provide for a safe travel way to each residence. Notification to adjoining residents is to be given by the Contractor within a reasonable time to facilitate their arrival or departure from the residence. Notification to the Borough Council shall be given prior to any traffic restrictions, detours or road closings for coordination purposes.

D. COMPARISON OF BIDS

The bid proposals will be compared on the basis of the sum of the unit prices that appear on the Proposal Form. For a bid to be acceptable, unit prices for additions or deductions must agree with the total lump-sum price breakdown.

E. CONTRACT DRAWINGS AND SPECIFICATIONS

The plan copies or drawings of this project, prepared by Gibson-Thomas Engineering Co., Inc. and KD3 Design Studio, Inc., are included in these contract documents and on PennBID are hereby made an integral part of these contract Documents and Specifications. One set of the Contractor's drawings and Specifications shall be available at the job site at all times for use by the Engineer or his authorized representative.

F. BASIS OF PAYMENT

The work required by this Contract shall be paid for as detailed in the Standard Contract Provisions. Monthly payments will be made during the progress of the work, based upon the value of the work done as detailed in the Standard Contract Provisions. Adjustments in payments because of changes in the construction from that indicated in the Contract Drawings and Specifications, or by exigencies of the work and as authorized by the Engineer, will be in accordance with the requirements of the Standard Contract Provisions.

G. PAYMENT OF PREVAILING WAGES

The Contractor must compensate all employees associated with this project in accordance with the prevailing wage determinations made a part of these contract documents. The prevailing wage information must be displayed at a high-visibility site located in the contract work area. Pennsylvania Prevailing Wages apply to this project.

H. PRE-CONSTRUCTION CONFERENCE

A pre-construction conference will be held with Borough and Borough Engineer prior to the commencement of the project. Working sequence, scheduling, traffic control and safety will be discussed and determined with Borough President and Borough Engineer.

I. CONSTRUCTION STAKE-OUT

The contractor will be furnished with all benchmarks and field information from the original survey notes. The contractor will be responsible for the stakeout of all construction work included in this contract. This work shall be subject to the approval of the Engineer.

J. TEMPORARY SERVICES

It shall be the responsibility of the General Contractor to provide temporary services throughout the entire period of construction and until the work performed under his contract is completed and the placed in operation with the Owner's personnel. The temporary services shall include heat and water, as follows:

a. Temporary Heat

Prior to enclosure of the pump pit building or portions thereof, and when weather conditions indicate the necessity for temporary heat as determined by the Engineer, the General Contractor shall provide, maintain, operate and pay all costs including fuel for the sufficient number of approved portable heaters so the progress of the work is not impeded.

After the pump pit building or portions thereof are enclosed and the outside temperature falls below 50° F during normal working hours or below 35° F at any other time, the General Contractor shall provide for temporary heat. A tank shall be considered "enclosed" when (a) the exterior walls have been completed; and (b) when openings are closed with either temporary or permanent closures.

The General Contractor shall operate portable heaters or maintain a temporary heating system. The General Contractor shall pay all costs including fuel for the operation and maintenance of the equipment, either temporary or permanent, to provide adequate heat. The tank or tanks shall be maintained at a minimum temperature of 50° F except when a lower temperature is authorized by the Engineer. The General Contractor shall remove all soot, smudges and other deposits from walls and all exposed surfaces which are the result of the use of any temporary heating equipment including the use of the permanent heating system for temporary heat purposes. He shall not do any finish work until all such surfaces are properly cleaned. The General Contractor shall be responsible for the dismantling and/or removal of portable heaters and other temporary heating apparatus and equipment.

K. COORDINATION OF WORK – ALL CONTRACTS

It is essential that the Contractors communicate on this job. A list of Contractors will be supplied by the Engineer prior to the start of work. The Contractors are directed to check on the progress of each contract to maintain a smooth flow of trades throughout the duration of the project. The Owner and Engineer will not be responsible for changes or rework necessary due to lack of coordination between Contractors.

END OF SECTION

SECTION 2
WORK RESTRICTIONS

A. GENERAL

1. Related Documents

   Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

2. Summary

   This Section includes work restrictions for the Project.

3. Use of Premises

   a. During the construction period each Prime Contractor shall coordinate its use of the premises for construction operations, including use of the site, compliance with state and local procedures and regulations regarding the use of site and surrounding public ways.

   b. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.

      1) Limits: Confine construction operations to areas of new construction.

      2) Clean wheels of construction vehicles before leaving construction site. Keep Owner's access roads and public roads free of construction dirt.

      3) The Contractor shall coordinate with the Owner or his representative for the purpose of defining and regulating temporary lay-down and storage areas, temporary utility hookups, and any other items which may require the use of various portions of the site.

   c. Working Hours

      Working hours and times for delivery of material and removal of debris and trash shall be as follows:

      1) 6:00 a.m. – 8:00 p.m.

      2) No Work shall be performed on weekends or holidays without Owner's approval.

END OF SECTION

SECTION 3
SUBMITTAL AND TESTING PROCEDURES

A. GENERAL

1. Related Documents

   a. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

   b. Certain specification sections contain additional submittal procedures for specified items. The requirements stated therein shall be primary for those items.

2. Summary

   a. This Section includes administrative and procedural requirements for submittals, including the following:

      1) Shop Drawings.

      2) Product Data.

      3) Samples.

      4) Informational Submittals: Miscellaneous submittals

      5) Requests for Information (RFI); requests for clarification and interpretation.

3. Definitions

   a. Action Submittals: Written and graphic information that requires Architect/Engineer's responsive action.

   b. Informational Submittals: Written information that does not require Architect/Engineer's approval. Submittals may be rejected for not complying with requirements.

4. Submittal Procedures

   a. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

      1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

      2) Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a) Architect/Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

b. Processing Time

Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect/Engineer's receipt of submittal.

1) Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect/Engineer will advise Contractor when a submittal being processed must be delayed for coordination.

2) Concurrent Review: Where concurrent review of submittals by Architect/Engineer's consultants, Owner, or other parties is required, allow 14 days for initial review of each submittal.

3) If intermediate submittal is necessary, process it in same manner as initial submittal.

4) Allow 10 days for processing each resubmittal.

5) No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

c. Identification

Place a permanent label or title block on each submittal for identification.

1) Indicate name of firm or entity that prepared each submittal on label or title block.

2) Provide a space on label or beside title block to record review and approval markings and action taken by Architect/Engineer.

3) Include the following information on label for processing and recording action taken:

a) Project name.

b) Date.

c) Name and address of Architect/Engineer.

d) Name and address of Contractor.

e) Name and address of subcontractor.

f) Name and address of supplier.

g) Name of manufacturer.

h) Unique identifier, including revision number.

i) Number and title of appropriate Specification Section.

j) Drawing number and detail references, as appropriate.

k) Other necessary identification.

d. Deviations

Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

e. Additional Copies

Unless additional copies are required for final submittal, and unless Architect/Engineer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

f. Transmittal

Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect/Engineer return submittals, without review, received from sources other than Contractor.

1) Paper or Electronic submittals may be provided, except for color and texture approvals. Send to or Email to Borough Engineer for distribution.

2) On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect/Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.

3) Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

4) Transmittal Form: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Names of subcontractor, manufacturer, and supplier.
   f. Category and type of submittal.
   g. Submittal purpose and description.
   h. Submittal and transmittal distribution record.
   i. Remarks.
   j. Signature of transmitter.

g. Distribution

Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

h. Use for Construction

Use only final submittals with mark indicating action taken by Architect/Engineer in connection with construction.

i. Requests for clarification or interpretation including Request for Information (RFI) shall be in writing (mailed or emailed) to the Engineer – copy Architect.

B. PRODUCTS

1. Action Submittals

a. Shop Drawings

Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1) Preparation: Include the following information, as applicable:
   a) Dimensions.
   b) Identification of products.
   c) Fabrication and installation drawings.
   d) Roughing-in and setting diagrams.
   e) Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f) Shopwork manufacturing instructions.
   g) Templates and patterns.
   h) Schedules.
   i) Design calculations.
   j) Compliance with specified standards.
   k) Notation of coordination requirements.
   l) Notation of dimensions established by field measurement.

2) Wiring Diagrams

Differentiate between manufacturer-installed and field-installed wiring.

5) Sheet Size

Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

4) Number of Copies

Submit 5 prints for the Architect/Engineer's review.

a) The Architect/Engineer will stamp each submittal with a uniform action stamp; refer to Article 3.02

b) Distribution: Contractor is responsible for distributing required prints of shop drawings to his subcontractors and material suppliers after review by the Architect/Engineer.

c) One copy of each shop drawing shall be kept at the project site.

d) Contractor shall submit one copy of each shop drawing to the Owner at the end of the project as a "Record Document."

b. Samples

Prepare physical units of materials or products, including the following:

1) Samples for Initial Selection

Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

2) Samples for Verification

Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

3) Preparation

Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect/Engineer's sample where so indicated. Attach label on unexposed side that includes the following:

a) Generic description of Sample.

b) Product name or name of manufacturer.
c) Sample source.

4) Additional Information

On an attached separate sheet, prepared on Contractor's letterhead, provide the following:

a) Size limitations.
b) Compliance with recognized standards.
c) Availability.
d) Delivery time.

5) Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

a) If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least 3 sets of paired units that show approximate limits of the variations.

b) Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

6) Number of Samples for Initial Selection

Submit 1 full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect/Engineer will return submittal with options selected.

7) Number of Samples for Verification

Submit 3 sets of Samples. Architect/Engineer will retain 1 Sample set; remainder will be returned.

a) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

8) Disposition

Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a) Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b) Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

c. Product Schedule or List

Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1) Type of product. Include unique identifier for each product.

2) Number and name of room or space.

3) Location within room or space.

2. Architecture/Engineer's Action

a. General

Architect/Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

b. Action Submittals

Architect/Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect/Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1) Architect/Engineer's action on shop drawings will result in making one of five notations on them; namely "SATISFACTORY," "UNSATISFACTORY," "SATISFACTORY AS NOTED," "SATISFACTORY AS NOTED, REVISIONS REQUIRED," or "UNSATISFACTORY, REVISE AND RESUBMIT."

2) Final Unrestricted Release: When the Architect/Engineer marks a submittal "SATISFACTORY," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

3) Final-But-Restricted Release: When the Architect/Engineer marks a submittal "SATISFACTORY AS NOTED" the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

a) Resubmit to Architect/Engineer a file copy of submittal stamped by Architect/Engineer as "SATISFACTORY AS NOTED," after the corrections have been made.

4) Returned for Re-submittal: When the Architect/Engineer marks a submittal "SATISFACTORY AS NOTED, REVISIONS REQUIRED," or "UNSATISFACTORY, REVISE AND RESUBMIT," do not proceed with Work

covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

a) Do not use, or allow others to use, submittals marked "UNSATISFACTORY," SATISFACTORY AS NOTED, REVISIONS REQUIRED," or "UNSATISFACTORY, REVISE AND RESUBMIT," at the Project Site or elsewhere where Work is in progress.

3. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the Architect/Engineer will return the submittal marked "Action Not Required."

c. Informational Submittals

Architect/Engineer will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect/Engineer will forward each submittal to appropriate party.

d. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

C. TESTING

As required by applicable specification sections.

END OF SECTION

SECTION 4
GENERAL MECHANICAL (23000)

A. GENERAL

1. RELATED DOCUMENTS

   All Contract Drawings, Specification Sections, Drawings, Addendums, and general provisions of the Contract, including, but not limited to, General Conditions of the Construction Contract and Instructions to Bidders, apply to the Work outlined in this Section.

2. WORK INCLUDED

   These Specifications and accompanying Drawings are intended to cover the furnishing of all labor, materials, equipment and services necessary for the installation of new HVAC systems. Small items of material, equipment and appurtenances not mentioned in detail or shown on the Drawings, but necessary for complete and operational systems, shall be furnished and installed by this Contractor without additional charge to the Owner and shall be included under this Contract.

   a. Visit the site and verify all conditions.
   b. Coordinate utility tap-ins. Borough will pay all tap in fees.
   c. Obtain all required permits for this work.
   d. Provide a complete direct fired heating/ventilation system for the maintenance area.
   e. Furnish gas heaters. Coordinate with the Electric and Plumbing Contractors.
   f. Provide air distribution systems including grilles, registers, diffusers, ductwork, dampers, etc.
   g. Provide a heating and air conditioning system complete air handling unit, coils, condensing unit, tubing, accessories and controls.
   h. Provide gas piping to all heating units.
   i. Provide all required controls and control wiring.
   j. Provide exhaust fans, ductwork, louvers and roof or wall caps

3. CODES AND REGULATIONS

   a. All Work and materials shall conform, but not be limited to, the following general regulatory agencies and codes. Note that individual specification Sections may refer to more specific codes which are also applicable:
      1) Shiremanstown Borough regulations and ordinances.
      2) Pennsylvania Department of Labor and Industry.
      3) Occupational Safety and Health Administration (OSHA).

4) ASHRAE
5) SMACNA NEC OSHA BOCA NFPA
6) Pennsylvania Act 222
7) NFPA 70
8) Americans With Disabilities Act of 1990
9) Pennsylvania Department of Environmental Protection (DEP).
10) Federal Environmental Protection Agency (EPA).

b. Absolutely no extra claim for compensation shall be allowed for changes necessitated by Code compliance regardless of how shown, or specified, and the bidding Contractor hereby waives all his rights to such extra compensation.

4. PERMITS, INSPECTIONS, FEES AND CHARGES

a. The Borough will pay for all permits. The Contractor shall pay for all inspections.

b. The Contractor shall give all requisite notice to all authorities having jurisdiction (AHJ), and shall obtain all permits, provide deposits, and inspection fees necessary for the installation of the Work.

c. Certificates of Inspection: deliver free of charge to the Owner before final payment is made. Inspection shall be performed for all aspects of the wiring system.

5. COORDINATION OF WORK WITH OTHER TRADES AND SCHEDULING

a. It is imperative that This Contractor coordinate his work with the Project Manager, General Contractor and all other trades involved with the installation of his equipment or working in the same building areas in which he is working.

b. The National Electrical Code gives the Electrical Contractor the right of way for space above his equipment such as panel boards, motor controls centers, distribution boards, transformers, etc. It is extremely important to coordinate all piping installations with the E.C.

c. The spacing between the water heater combustion air intake and the vent is critical as is the spacing to the boiler combustion air intake and vent. It is very important to coordinate the installation of the intake and vent with the Mechanical Contractor.

6. WORK NOT INCLUDED IN THIS CONTRACT

a. Finish patching and painting.

b. Trenching and trench restoration.

7. ROOF PENETRATIONS

This Contractor shall be responsible for the cutting of the roof for the purpose of installing HVAC vents and louvers, mechanical connections and provide required new flashings of type and style required.

8. CUTTING AND PATCHING

a. This Contractor shall be responsible for all cutting and rough patching required by him for the proper accomplishment of his work and the installation of piping and all equipment.

b. Coordinate necessary floor slab penetrations. No building structural members, including the floor slab, shall be cut, drilled or removed if the building integrity will be compromised in any way for the installation of this work.

c. Concrete or asphalt shall be saw cut and patched to match the original surface.

9. RECORD DRAWINGS

a. The Contractor shall keep an accurate record of all deviations from the Contract Documents.

b. The Contractor shall correctly and neatly enter in red pencil any deviations to the Contract Documents and shall keep the Contract Documents available at the jobsite for inspection.

c. "As built" drawings and documents shall be turned over to the Owner upon completion.

10. TESTS

a. At completion of the job and before final acceptance, the HVAC and other mechanical system as a whole shall be given a final test with all equipment tested and proved to be operating in compliance with installation requirements. Any improperly operating components shall be replaced by the Contractor without additional cost to the Owner or General Contractor. The tests shall be made only in the presence of the Owner and the design Professional(s). Full satisfaction shall be guaranteed by the Contractor.

B. PRODUCTS (Not applicable).

C. EXECUTION (Not applicable).

END OF SECTION 23000

SECTION 230993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. Related Sections include the following:

1. Section 230900 "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. VAV: Variable air volume.

1.4 SPLIT SYSTEM

A. System shall be controlled by a 10 day programmable thermostat.

B. Unoccupied Mode: Upon a rise or drop in space temperature as sensed by a wall-mounted thermostat above or below the space setpoint, the indoor unit fan shall cycle on and the compressors in the outdoor unit shall cycle to maintain temperature. Upon satisfaction of the space temperature, the indoor unit fan and outdoor unit compressor shall de-energize.

C. Occupied Mode: Indoor unit fan shall run continuously. Upon a rise or drop in space temperature as sensed by a wall-mounted thermostat above or below the space setpoint, the compressors in the outdoor unit and the staged gas heater in the furnace shall cycle

to maintain temperature. Upon satisfaction of the space temperature, the gas furnace heater and outdoor unit compressors shall de-energize.

D. The system shall be controlled by the system's manufacturer's controls.

1.5 GAS UNIT HEATER

A. The system shall be controlled by a wall-mounted thermostat. Upon a drop in space temperature below the space setpoint, the fan and gas heater shall cycle to maintain temperature. Upon satisfaction of the space temperature, the unit shall de-energize.

B. The system shall be controlled by the system's manufacturer's controls.

1.6 EXHAUST FAN

A. The unit shall be controlled by manual switch.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

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. Manual volume dampers.
   2. Flange connectors.
   3. Turning vanes.
   4. Duct-mounted access doors.
   5. Flexible connectors.
   6. Flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

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

   1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

      a. Special fittings.
      b. Manual volume damper installations.
      c. Control-damper installations.
      d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
      e. Duct security bars.

f. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

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 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.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. 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.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. Flexmaster U.S.A., Inc.
    d. McGill AirFlow LLC.
    e. Nailor Industries Inc.
    f. Pottorff.
    g. Ruskin Company.
    h. Trox USA Inc.
    i. Vent Products Company, Inc.

2. Standard leakage rating[, with linkage outside airstream].
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
    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.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. 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.

2.5 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - 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.

2.6 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.
5. 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 two 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.

2.7 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; [polyethylene] [aluminized] vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 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.

2.8 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts 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

C. 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.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. 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. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
5. Control devices requiring inspection.
6. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

I. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment.

K. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

L. Connect flexible ducts to metal ducts with draw bands.

M. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. 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.

END OF SECTION

SECTION 233423

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Ceiling-mounted ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on [actual Project site elevations] [sea level].

B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Fan speed controllers.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Breidert Air Products.
   2. Broan-NuTone LLC; NuTone Inc.
   3. Carnes Company.
   4. Greenheck Fan Corporation.
   5. Loren Cook Company.

B. Ceiling-mounted exhaust fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of galvanized steel. The polypropylene duct collar shall be 6” in diameter and shall include a backdraft damper. The grille shall be constructed of non-yellowing high-impact polystyrene and attached to the housing with hidden attachment screws. The access for wiring shall be internal and of the plug-in type.

C. The motor shall be mounted on vibration isolators. The fan wheel shall be of the forward-curved centrifugal type, constructed of calcium carbonate filled polypropylene and dynamically balanced. All fans shall bear the AMCA Certified Ratings program AMCA Sound and Air Performance Seal and shall be UL/cUL Listed.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using elastomeric hangers. Vibration- control devices are specified in Section 230548 "Vibration Controls for HVAC Piping and Equipment."

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Rectangular and square ceiling diffusers.
   2. Fixed face grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Square Ceiling Diffusers (SD-1 and SD-2):
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Price Industries SPD or comparable product by one of the following:
      a. Anemostat Products; a Mestek company.
      b. Carnes.
      c. Hart & Cooley Inc.
      d. Krueger.
      e. METALAIRE, Inc.
      f. Nailor Industries Inc.
      g. Price Industries.
      h. Titus.
      i. Tuttle & Bailey.

   2. Construction:
      a. Diffusers shall be steel and shall consist of a seamless, one-piece, precision formed backpan that incorporates a round inlet collar of sufficient length for connecting rigid or flexible duct.
      b. An inner plaque assembly shall be incorporated and shall drop no more than ¼" below the ceiling plane to assure proper air distribution performance.
      c. The inner plaque assembly shall be completely removable from the room side to allow for full access to any dampers or other ductwork components located near the diffuser neck.
      d. The diffuser shall integrate with all duct sizes on the plans without affecting the face size and appearance of the unit.
      e. The face panel shall have smooth edges and rounded corners to blend with the back cone.
      f. The diffuser ceiling module size shall be 24x24.
   3. Paint Specification:
      a. All components shall have a baked-on powder coat finish.
         1) The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 and ASTM D4752 paint durability tests.
         2) The paint film thickness shall be a minimum of 2.0 mils.
         3) The finish shall have a hardness of 2H.
         4) The finish shall withstand a minimum salt spray exposure of 500 hours with no measurable creep in accordance with ASTM D1654, and 1000 hours of exposure with no rusting or blistering as per ASTM D610 and ASTM D714
         5) The finish shall have an impact resistance of 80 inch-pounds.
      b. Mounting Frame:

1) The diffuser mounting frame shall be suitable for lay-in or surface mount applications.

2.2 REGISTERS AND GRILLES

A. Fixed Face Grille (ALL RETURN GRILLES):
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Price Industries 630 or comparable product by one of the following:
      a. Anemostat Products; a Mestek company.
      b. Carnes.
      c. Hart & Cooley Inc.
      d. Krueger.
      e. Nailor Industries Inc.
      f. Price Industries.
      g. Titus.
   2. Construction:
      a. Grille shall be 45 degree deflection fixed louver type, and shall have one set of blades with ¾" on center blade spacing.
      b. The grilles front blade orientation shall be front blades parallel to the long dimension.
      c. The blades and border shall be extruded aluminum construction.
   3. Paint Specification:
      a. All components shall have a baked-on powder coat finish.
         1) The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 and ASTM D4752 paint durability tests.
         2) The paint film thickness shall be a minimum of 2.0 mils.
         3) The finish shall have a hardness of 2H.
         4) The finish shall withstand a minimum salt spray exposure of 500 hours with no measurable creep in accordance with ASTM D1654, and 1000 hours of exposure with no rusting or blistering as per ASTM D610 and ASTM D714
         5) The finish shall have an impact resistance of 80 inch-pounds.
   4. Mounting Frame:
      a. The grille shall be supplied with a 3/8" flat border mounting frame.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 235400

FURNACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Gas-fired, condensing furnaces and accessories complete with controls.
2. Air filters.
3. Refrigeration components.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:

1. Furnace.
2. Thermostat.
3. Air filter.
4. Refrigeration components.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals for each of the following:

1. Furnace and accessories complete with controls.
2. Air filter.
3. Refrigeration components.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Disposable Air Filters: Furnish two complete sets.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:

1. Warranty Period, Commencing on Date of Substantial Completion:

a. Furnace Heat Exchanger: 10 years.
b. Integrated Ignition and Blower Control Circuit Board: Five years.
c. Draft-Inducer Motor: Five years.
d. Refrigeration Compressors: 10 years.
e. Evaporator and Condenser Coils: Five years.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
1. American Standard Companies, Inc.
2. Bryant Heating & Cooling Systems; Div. of United Technologies Corp.
3. Carrier Corporation; Div. of United Technologies Corp.
4. Luxaire Corporation; a division of Unitary Products Group.
5. Rheem Manufacturing Company; Air Conditioning Division.
6. Ruud Air Conditioning Division.
7. Trane.
8. York International Corp.; a division of Unitary Products Group.

B. General Requirements for Gas-Fired, Condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.

C. Cabinet: Galvanized steel.

1. Cabinet interior around heat exchanger shall be factory-installed insulation.
2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
3. Factory paint external cabinets in manufacturer's standard color.
4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Special Motor Features: Single speed, Premium (TM) efficiency, as defined in Section 230513 "Common Motor Requirements for HVAC Equipment," and with internal thermal protection and permanent lubrication.
3. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

4. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.

E. Type of Gas: Natural.

F. Heat Exchanger:

1. Primary: Aluminized steel.
2. Secondary: Polyethylene-coated steel.

G. Burner:

1. Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

H. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

I. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

J. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.

K. Accessories:

1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.

2. PVC Plastic Vent Materials:

a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
c. PVC Solvent Cement: ASTM D 2564.

1) PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2) Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3) Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 AIR FILTERS

A. Disposable Filters: 1-inch- thick fiberglass media[with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.

2.3 REFRIGERATION COMPONENTS

A. General Refrigeration Component Requirements:

1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."

B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1.

1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.

C. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I, 1 inch thick.

D. Air-Cooled, Compressor-Condenser Unit:

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor: Hermetically sealed reciprocating or scroll type.

    a. Crankcase heater.
    b. Vibration isolation mounts for compressor.
    c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
    d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
    e. Refrigerant Charge: R-410A.

3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
4. Heat-Pump Components: Reversing valve and low-temperature air cut-off thermostat.
5. Fan: Aluminum-propeller type, directly connected to motor.
6. Motor: Permanently lubricated, with integral thermal-overload protection.
7. Low Ambient Kit: Permits operation down to 45 deg F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.

B. Controls: Install thermostats and humidistats at mounting height of 48 inches above floor.

C. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

D. Install ground-mounted, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Section 033053 "Miscellaneous Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

3.3 CONNECTIONS

A. Gas piping installation requirements are specified in Section 221123 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
    c. Requirements for Low-Emitting Materials:
        1) PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
        2) Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
        3) Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

4. Slope pipe vent back to furnace or to outside terminal.

D. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."

E. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled, compressor-condenser unit.

1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
2. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
3. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casings.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Adjust vibration isolation and flexible connections.
6. Verify that controls are connected and operational.

B. Adjust fan belts to proper alignment and tension.

C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

D. Measure and record airflows.

E. Verify proper operation of capacity control device.

F. After startup and performance test, lubricate bearings[and adjust belt tension].

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

A. After completing installation, clean furnaces internally according to manufacturer's written instructions.

B. Install new filters in each furnace within 14 days after Substantial Completion.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION

SECTION 235533

FUEL-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes gas-fired unit heaters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of fuel-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired unit heaters to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One for each belt-driven fan size.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 GAS-FIRED UNIT HEATERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Lennox Industries, Inc.
2. Modine Manufacturing Company.
3. Reznor/Thomas & Betts Corporation.
4. Sterling HVAC Products; Div. of Mestek Technology Inc.

B. Heat Exchanger: The heat exchanger shall be aluminized 409 stainless steel. Die-formed burners shall be of aluminized steel and include flared ports and a stainless steel insert. The units shall be designed to provide 80% thermal efficiency.

C. Controls: Controls shall include a 24-volt transformer, single stage gas control system; an intermittent spark pilot with electronic flame supervision; fan and limit safety controls; an open, drip-proof (totally enclosed) fan motor with internal overloads; and a blocked vent switch system.

D. Cabinet: The cabinet is quipped with a full safety fan guard and horizontal louvers for directing airflow. The unit is arranged for ceiling suspension with 2-point threaded ahnger connections.

E. Certifications: Design certified to ANSI and CAN/CGA Standards by the Canadian Standards Association for Installation in the United States and Canada.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and connect gas-fired unit heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.

B. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

1. Restrain the unit to resist code-required horizontal acceleration.

2. Rubber hangers are specified in Section 230548 "Vibration Controls for HVAC Piping and Equipment"

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to fuel-fired unit heater to allow service and maintenance.

C. Gas Piping: Comply with Section 231126 "Facility Liquefied-Petroleum Gas Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

D. Electrical Connections: Comply with applicable requirements in electrical Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify bearing lubrication.
3. Verify proper motor rotation.
4. Test Reports: Prepare a written report to record the following:

    a. Test procedures used.
    b. Test results that comply with requirements.
    c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

A. Adjust initial temperature set points.

B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fuel-fired unit heaters. Refer to Section 017900 "Demonstration and Training."

END OF SECTION