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Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

1. GENERAL INSTRUCTIONS

A. GENERAL REQUIREMENTS

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and division. Where the requirements under Division 01, this section and division take precedence. Become thoroughly familiar with all its contents so as to understand how the Division 01 and this section and division include all material, equipment, appliances, transportation, facilities, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to facilitate the function of each system as implied by the design and the equipment specified.

The specifications and drawings for the project are complementary, and any portion of work described in one shall be provided as if described in both. In the event of discrepancies, notify the Engineer and request clarification prior to proceeding with the work involved.

Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work and indicate the intended general arrangement of the systems, without showing all of the exact details as to elevations, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and when when installed per manufacturers' requirements, will ensure a complete, coordinated, satisfactory, and properly operating system.

B. DEFINITIONS

Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations."

Install: "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete and ready for the intended use."

Provide: "to furnish and install."

Furnished by Owner (or Owner-Furnished) or Furnished by Others: "an item furnished by the Owner or under other divisions or contracts, and installed under the requirements of this division, complete and ready for intended use, including all items and services incidental to the work necessary for proper installation and operation. Include the installation under the warranty required by this division."

Engineer: Where referenced in this division, "Engineer" is the Engineer of Record and the Design Professional for the work under this division, and is a consultant to, and an authorized representative of the Architect, as defined in the General and/or Supplementary Conditions. When used in this division, Engineer means increased involvement by and obligations to the Engineer, in addition to involvement by and obligations to the Architect.

AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the work.

NRTL: Nationally recognized testing laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA), and acceptable to the AHJ over this project. Nationally recognized testing laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.

The terms "approved" or "approved/," "on-label," or "tagged" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified." The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. PREBID SITE VISIT

prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification to request or obtain cost compensation over and above the contract price.

D. MATERIAL AND WORKMANSHIP

Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, of best quality normally used for the purpose in good commercial practice, and free from defects. Model numbers listed in the specifications or shown on the drawings are not necessarily intended to designate the required item, within descriptions of the item given or model numbers.

Pipe, pipe fittings, pipe specialties and valves shall be manufactured in plants located in the United States or certified to meet the specified ASTM and ANSI standards.

Work performed under this contract shall provide a neat and "workmanlike" appearance when completed, to the satisfaction of the Architect and Engineer. Work areas shall be kept as free as possible from equipment, materials, and debris. Installations shall comply with applicable codes and laws.

The complete installation shall function as designed and intended with respect to efficiency, capacity, noise level, etc. Abnormal noise caused by rattling equipment, piping, ducts, air devices, and squeaks in rotating components shall not be acceptable. Materials and equipment shall be of commercial specification grade in quality. Light duty and residential grade equipment shall not be accepted unless otherwise indicated.

Remove from the premises waste material present as a result of work, including cartons, crumpled paper, stickers, and/or excavation material not used in backfilling, etc. Clean equipment installed under this contract to present a neat and clean installation at the termination of the work.

Repair or replace public and private property damaged as a result of work performed under this contract to the satisfaction of authorities and agencies having jurisdiction. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

E. MANUFACTURERS

In other articles where lists of manufacturers are introduced, subject to compliance with requirements, provide products by one of the manufacturers specified.

Where a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.

When a manufacturer is not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for not less than 5 years.

F. COORDINATION

Coordinate work with that of other trades so that the various components of the systems are installed at the proper time. It will fit the available space, and will allow proper service access to those items requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.

Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified herein. Contractor shall furnish the General Contractor with information where chases and openings are required. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner so as not to interfere with or delay the work of other trades.

Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as variations may occur. Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection.

Provide materials with trim that will properly fit the types of ceiling, wall, or floor finishes actually installed. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required item.

G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes adopted by the local AHJ, including any amendments and standards as set forth by the following:

- National Electric Code (NEC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)
- Occupational Safety and Health Administration (OSHA)
- American Society of Mechanical Engineers (ASME)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- American National Standards Institute (ANSI)
- American Society of Testing Materials (ASTM)
- Other national standards and codes where applicable.

Where the contract documents exceed the requirements of the referenced codes, standards, etc., the contract documents shall take precedence. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent.

Properly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and requirements to the attention of the Architect and Engineer for final resolution. Contractor will be held responsible for any violation of the law.

Procure and pay for permits and licenses required for the accomplishment of the work herein described. Contractor shall pay for and furnish certificates of inspection to Owner.

H. PROTECTION OF EQUIPMENT AND MATERIALS

Store and protect from damage equipment and materials delivered to job site. For material and equipment not acceptable to change weather conditions, dampness, or temperature variations, store inside in conditioned spaces. For material and equipment that is not acceptable in these conditions, cover with waterproof, tear-resistant, heavy tarp or polyethylene plastics as required to protect material and equipment from weather. Equipment and material damaged by transportation activities shall be repaired and Contractor shall have new equipment and material of the kind at his own expense.

Keep premises broom clean of foreign material created during work performed under this contract. Piling equipment, etc. shall have a neat and clean appearance at the termination of the work.

Plug or cap open ends of ductwork and piping systems while not installed during construction. Do not use to prevent the entrance of debris into the systems.

I. SUBSTITUTION

Materials, products, equipment and systems specified in the Division 23 specifications shall establish a standard of required function, dimension, appearance and quality to be met by the work under this contract. The base bid shall include only the products from manufacturers specifically named in the drawings and specifications. To meet the requirements set forth, the Substitution Request Form from the Architect or Engineer. Complete and send the Substitution Request Form to the Architect or Engineer. The work under this contract shall conform to the system that is proposed to be substituted. The burden of proof of the merit of the proposed substitution shall rest upon the Contractor.

Unless a separate writing be made to the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:

- The proposed substitution has been investigated and determined to meet or exceed the specified Work in all respects unless stated otherwise.
- The substitution request is not made to the Contractor's detriment.
- The Contractor Documents will produce indicated results, including functional clearances, material, workmanship, and performance parts.
- The substitution request has received necessary approvals of authorities having jurisdiction.
- The substitution will be furnished as required.
- The substitution fails to perform as required, Contractor shall replace substitute material or system with that originally specified and bear the cost of replacement.
- When a substitution is made, the Contractor will be responsible for the work as necessary for accepted substitution will be complete in all respects.

Substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution documentation. Substitutions will be considered prior to bids or receipt of bids, such approval will be stated in an addendum. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given. No substitutions will be considered after the contract is awarded unless specifically provided in the contract documents.

J. SUBMITTALS

Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and items requiring coordination between contract parties. Provide submittals in sufficient detail so as to demonstrate compliance with these contract documents and the design concept. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible and suitable for the intended use, will fit the available space, and maintain a manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed layout.

Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus toll-free mailing time via the Architect, plus a duplication of this time for resubmittal, if required. Only resubmit those submittals requested for resubmittal.

Submittals shall contain the project name, applicable specification section, submittal date, equipment identification acronym as used on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance sheets, samples and other submittals required by this division. Highlight, mark, list, or indicate the materials, performance criteria, and accessories that are necessary any change in location or configuration, submit a shop drawing showing the proposed layout.

Submittals and shop drawings shall not contain the firm name, logo, seal, or signature of the Engineer. They shall not be copies of the work product of the Engineer. If the Contractor desires to use elements of such form, refer to paragraph "Electronic Drawing Files" for procedures to be used.

Separate submittals according to individual specification sections. Illegible submittals will be rejected and returned without review. Catalog data shall be properly bound, identified, and tabbed in a 3-ring binder. Each item or model number shall be clearly marked and accessories indicated. Label the catalog data with the equipment identification acronym or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, brackets, wiring diagrams, electrical requirements and deviations from specified equipment or materials. For equipment with rotor starters or VFDs, include short-circuit current ratings. Mark out incompatible items. Shop drawings will be returned without review if the above mentioned requirements are not met.

Provide the quantity of submittals required by Division 01. If not indicated and hard-copy sets are provided, submit a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in accordance with the procedures specified in Division 01. Contractor shall notify the Architect and Engineer that the submittal have been posted. If electronic submittal procedures are not defined in Division 01, Contractor shall include the website, user name, and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the designated representatives of the Architect and Engineer. Contractor shall allow for the Engineer review and comments to be returned in the contract schedule. Contractor shall submit only the documents required to purchase the materials and/or equipment in the electronic submittal.

The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not relieve the Contractor from responsibility for deviations from the drawings and specifications, errors in dimensions, details, size of members, or quantities, omissions of components or fittings, coordination of electrical requirements, and not coordinating items with actual building conditions and adjacent work. Proceed with the procurement and installation of equipment only after receiving approved shop drawings relative to each item.

K. ELECTRONIC DRAWING FILES

In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format on CD-ROM disk, DVD disk, flash drive or direct download, as desired. From the Engineer for a shipping and handling fee of \$200 for a drawing set up to include \$15 per sheet. The electronic drawing files shall be provided in accordance with the specifications. The files shall be in a format that is approved for use and subject to shipping method and drawing format. In addition to payment, the written authorization from the Architect and release agreement form from the Engineer must be received before electronic drawing files will be sent.

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings. Insert one set into each copy of the manual described below.

See Division 01 and General Conditions for additional information.

M. OPERATION AND MAINTENANCE INSTRUCTIONS

During the course of construction, collect and compile a complete brochure of equipment furnished and installed on this project. Include operational and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, approved submittals and shop drawings, warranties, and descriptive literature or pamphlets available from the manufacturer. Include an inside cover sheet listing the project name, date, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and an index of contents.

Submit three copies of literature bound in approved binders with index and tabs separating equipment sheets to the Architect, for the Engineer's review, at the termination of the work. Paper clips, staples, rubber bands, loose leaf binding, and mailing envelopes are not considered approved binders. Final approval of systems installed under this contract shall be withheld until this equipment brochure is received and deemed complete by the Architect and Engineer. Install workers to save required literature shipped with the equipment listed for inclusion in this brochure.

Include Record Drawings as described above.

Refer to Division 01 for acceptance of electronic manuals for this project. For electronic manuals, refer to paragraph "Submittals" for requirements.

N. SPARE PARTS

Furnish to Owner, with receipt, the following spare parts for the equipment furnished for this project:

- One set of spare parts of each type required for each unit.
- Install new filters prior to testing, adjusting, and balancing work and before running system over to Owner.
- Furnish one complete set of tools for each fan.
- Furnish spare operating keys for each type of air outlet and inlet that require them.

O. TRAINING

At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel on the operation and maintenance of the equipment provided for this project.

One set of spare parts of each type required for each unit.

Provide training to include, but not be limited to, an overview of the system and/or equipment as it relates to the facility as a whole, operation and maintenance procedures and schedules related to startup and shut-down, troubleshooting, servicing, preventive maintenance, and approved operator instructions, and review of data included in the operation and maintenance manuals. The Contractor and the Owner's representative shall certify that the training has been provided.

Schedule training with Owner with at least 7 days advance notice.

P. WARRANTIES

Warrant each system and each element thereof against all risks due to faulty workmanship, design, or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty. The construction documents or manufacturer's standard warranty exceeds 12 months, thereby extending the warranty beyond that specified in the General Conditions and Division 01.

Warranties shall include labor and material, including travel expenses, for the duration of the warranty or any longer period without any additional costs to the Owner, and to the satisfaction of the Owner, Architect, and Engineer.

Perform the remedial work promptly, upon written notice from the Engineer or Owner.

At the time of Substantial Completion, deliver to the Owner all warranties, in triplicate, and properly executed, including time limits for warranties extending beyond the one year period and any other warranties. The Owner will be able to determine the warranty status. Each warranty instrument shall be returned to the Owner with a true and correct copy of the same.

2. GENERAL MATERIALS AND INSTALLATION

A. BUILDING OPERATION

Comply with the specifications as outlined in the architectural portions of this specification. Building shall be in operation during normal business hours during installation. Coordinate interruption of building operation at a time when the building is not in operation and only with written notice to the Building Owner and/or tenant. Coordinate interruption of building operation with the Owner and/or tenant a minimum of seven (7) days in advance.

B. COORDINATION AND PROTECTION

Coordinate with the Architect, Engineer, and other trades. Repair work shall meet all requirements of the Owner, local authorities having jurisdiction, and meet the requirements of the Architect. Conform to requirements of Division 02 of this specification.

C. CEMENT SETTING AND PATCHING

Conform to the requirements in Division 01. Cut walls, floors, ceilings, and other portions of the facility as required to install work under this division. Obtain permission from the Architect prior to cutting. Do not cut or disturb structural members without prior approval from the Architect. Cut holes as small as possible. Patch walls, floors, and other portions of the facility as required by work under this division. Patching shall match the original material and construction including fire ratings, if applicable. Repair and refresh areas disturbed by work to the condition of adjoining surfaces in a manner satisfactory to the Architect.

D. ROUGH-IN

Coordinate without delay all roughing-in with other divisions. Conceal piping, conduit, and rough-in not installed in unfinished areas and where otherwise shown.

E. SUPPORT SYSTEMS

Structural steel used for support of equipment, ductwork and piping shall be new, clean, and conform to ASTM Designation A-36.

Support mechanical components from the building structure. Do not support mechanical components from ceilings, other mechanical or electrical components, and other non-structural elements.

F. ACCESS DOORS

Provide access doors for all concealed equipment where indicated or as required, except where above lay in ceilings. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches. Access doors must be of the proper construction for type of construction in which it is installed. Obtain Architect's approval of type, size, location, and color before ordering. Provide factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation, concealed hinges, flush screwdriver-operated cam lock, and anchor straps. Provide access doors as manufactured by Milcor, Tsum, Zum, or equal.

G. PENETRATIONS

Provide prefabricated roof curbs manufactured by Custom Curb, Inc., Pace Company, Thyrbur or approved equal. Provide roof curb with factory finish to meet SMACNA standards relative to gage, bracing, joints, etc. Minimum thickness of duct shall be 28 gage sheet metal. Reinforce housings and ductwork over 30 inches not with 1/4 inch angles and 3/8 inch bolts. Provide 1/2 inch thick, 3 pound rigid insulation, fully mirrored 3 inch raised curb, cover of weather resistant, weather-proof material and piping of attached material with stainless steel pipe clamps.

Provide box frames for rectangular openings welded 12 gage galvanized steel attached to frame and of a maximum dimension established by the Architect. Notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural drawings.

H. MOTORS AND STARTERS