

SECTION 23 00 01 – BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic HVAC Requirements specifically applicable to Division 23 sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

- A. All references in Division 23 to code standards or other publications shall be the latest edition/version, unless noted otherwise.

1.03 PLANS

- A. These specifications are accompanied by plans indicating typical layouts, pipe and equipment location, etc. The plans and these specifications are complimentary each to the other and what is called for by one shall be as binding as if called for by both. Should there be a conflict between Drawings and specifications regarding a material shown or work described or detailed then the material of work having the greater value shall be provided.
- B. The plans as prepared are in general diagrammatic. The contractor shall carefully lay out his work at the site to conform to the architectural, mechanical, electrical and structural conditions to provide grading of piping, to avoid all obstructions and to conform to details of installation as shown on the plans and supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated satisfactorily operating installation. **The General Contractor must coordinate the work of all trades.** All necessary offsets in piping, fittings, ductwork, etc. required to avoid interferences between piping, equipment, structural and architectural work are not shown but shall be furnished and installed by the Contractor without additional expense to the Owner.
- C. These specifications and plans accompanying same are intended to cover systems which will not interfere with the design of the building, which will fit into the available spaces, and which will insure complete and satisfactory systems. Each contractor shall, therefore, carefully examine the plans and the building and shall be responsible for the proper fitting of his material and apparatus into the building.
- D. The size of mechanical and electrical equipment indicated on the plans is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space with the manufacturer's recommended clearances allocated for same on the plans. It shall be the Contractor's responsibility to furnish data to evidence that sufficient space can be provided for the installation of proposed equipment and that adequate access will exist for servicing and maintenance of equipment. Should changes become necessary during construction, the contractor shall make such necessary changes at his (the Contractor's) own expense.
- E. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention no later than ten (10) days prior to the bid date, unless specified otherwise in Division 1. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus

or equipment.

1.04 CHANGES

- A. Any changes from the plans necessary to make this work conform to the building as it is constructed, to make this work fit the work of other trades or to make this work conform to the rules of city and municipal bodies having jurisdiction shall be made by this contractor at no additional cost to the Owner. However, no changes shall be made from the work described on the plans and these specifications except on written order from the Architect/Engineer.
- B. If any changes are required other than those mentioned above and the changes involve extra work on the part of the Contractor, no charges for this extra work shall be allowed unless authorized in advance of the work by a written order from the Owner and/or Architect/Engineer stating the charges to be made for the work.
- C. Proposed use of item or equipment other than that specified or indicated may require redesign of structure, partitions, foundations, piping, wiring, or other parts of mechanical, electrical, or architectural layout. Redesign, new drawings, and detailing required shall be prepared and submitted to Architect/Engineer for approval.
- D. Where approved deviation requires different quantity, size and arrangement of wiring, conduit, equipment, etc. from that specified or indicated, provide such items and all other additional equipment required by system at no additional cost to the Owner.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protection:
 - 1. All work, equipment and materials shall be protected at all time to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation.
 - 2. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 3. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Architect. In particular, ductwork insulation which becomes saturated will be rejected and must be removed from the job. Such repair or replacement shall be at no additional cost to the Owner.
 - 4. Protect interiors of new equipment, ductwork, and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - 5. Existing equipment, ductwork, and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- B. Cleanliness of Piping, Ductwork, and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Owner.
4. Boilers shall be left clean following final internal inspection by the inspector.
5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.06 EXISTING FACILITIES

- A. All piping, valves, fittings, switches, starters, conduit boxes and/or any other items of mechanical or electrical equipment which are not in service at the completion of this contract shall be removed, unless otherwise noted.
- B. Where an existing service to existing building requires disconnection to facilitate installation of this work, this Contractor shall include in his bid the cost of such disconnecting, re-routing and re-connecting. Where any existing facilities which are to remain occupied are affected by disconnection, re-routing or re-connection, then such disconnecting, re-connecting and re-routing shall be done in such a manner so as not to interrupt any service to the building. Satisfactory arrangements shall be made with local authorities and/or the various utility companies involved. The method of disconnecting, re-routing and re-connecting shall be as shown on the Drawings, or if not shown on the drawings, subject to the approval of the Architect and Owner.
- C. Unless noted otherwise, all equipment and material indicated or specified to be removed shall become the property of the Contractor.
- D. This Contractor shall carefully coordinate work in and around existing services and equipment and adjoining rooms to remodel areas. Coordinate shut-down, removal, capping, and turn-on of existing services with the Owner's facilities' department and general contractor to provide continuous (uninterrupted) service throughout the construction period. This Contractor shall refer to the architectural plans and specifications and thoroughly familiarize himself with the construction phasing in remodel areas before beginning work.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 50 degrees F minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by the Owner.

1.07 SUBSTITUTIONS

- A. The materials, products and equipment described and specified establish a standard of quality, function, dimension and appearance to be met by any proposed substitutions.
- B. Reference Section 01 60 00 – Product Requirements.

- C. Substitution requests are only required where specific manufacturers are listed or scheduled.

1.08 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. The Contractor shall furnish copies of the manufacturer's literature and drawings describing all proposed equipment and materials indicated in the specifications. The proposed use of the exact equipment and materials specified shall not change this requirement of including literature describing the proposed equipment. Manufactured items proposed for use, whether specified or proposed for substitution, shall be the current, catalogued product of the manufacturer, and replacement parts shall be available.
- C. Manufacturer's regular catalog sheets will not be acceptable under this requirement unless they indicate completely all of the specification requirements. Where drawings cover several sizes or types of construction they shall clearly indicate the size or type of construction to be used on the project. In cases where several sizes of the same type of equipment are required to be furnished, the submittal shall include a schedule identifying each piece of equipment, complete with all capacity information needed to compare every submitted item with its respective specified item. **Annotate to indicate exact model, size, and type submitted.**
- D. Brochures shall contain a certification that the equipment or materials are suitable for conditions shown and specified; that the equipment or materials are believed to be in conformity with the plans and specifications, except as may be specifically described and that approval is recommended. The certification shall be signed by the Contractor. Brochures received not in conformity with these requirements will be returned for required actions. Any deviation from the requirements of the specifications shall be clearly noted and marked for the Engineer's consideration.
- E. Approval of the brochures, or any part of the contents therein, shall not eliminate responsibility for compliance with the plans and specifications, unless specific attention has been called in writing to proposed deviations at the time of transmittal of the brochures and such deviations have been approved, nor shall it eliminate the requirements or the responsibilities, if there are errors of any sort in the data submitted.

1.09 INTERFERENCES AND COOPERATION

- A. The plans are generally diagrammatic and the Contractor shall coordinate the work of the different trades so that interferences between piping, equipment, structural and architectural work will be avoided. Not all offsets in piping, ductwork, etc., are shown. The Contractor shall cooperate with the General Contractor and all other contractors to coordinate their work to avoid interferences and delays and arrange all parts of the work to harmonize in service and appearance with all other parts.
- B. The General Contractor shall coordinate the work of all trades. The various systems to be installed shall follow the normal, common sense priority of systems installation with the highest system to lowest system installation as follows:
 - 1. HVAC ductwork shall be installed up and against building (floor/roof) structural members.

2. Sanitary waste and storm drainage piping system shall begin horizontal routing as high as possible between structural members, offsetting vertically only to avoid conflict with structure or to drop below HVAC ductwork where offset is unavoidable.
 3. Electrical conduit shall be installed up, and against building structure, running parallel with HVAC ductwork and offsetting up into structural bay (void) or below HVAC ductwork to obtain a change in direction or branch take-off. Electrical conduit installation shall not control or dictate the routing or installation of the HVAC ductwork.
 4. HVAC heating and chilled water supply and return piping, domestic hot and cold water supply and hot water circulating return piping, and medical gas piping shall be installed beside and below the HVAC ductwork and electrical conduit. Preferred installation shall be on trapeze, wall brackets, or racked on vertical channel on the wall above the ceiling line. The completed installation shall not conflict with the installation or removal of ceiling system components of tile. All main-run and branch take-off isolation valves shall be readily identifiable and accessible from a standing position on a step ladder.
 5. Fire sprinkler piping system shall be installed below all other systems and components. The fire sprinkler piping shall not conflict with the installation or removal of ceiling system components or tile. The fire sprinkler system piping layout and installation shall be coordinated by the fire sprinkler contractor and the General Contractor with all other trades performing work in the affected area, to avoid conflict with the installation or removal of any other systems components, or to prevent ready access to valves, equipment of the other trades. **Do not install sprinkler piping until ductwork mains are in place.**
- C. Provide an overhead coordination submittal per Section 01 30 00. The submittal shall include all structural, plumbing, mechanical, electrical and fire protection components.

1.10 MATERIALS AND WORKMANSHIP

- A. All materials shall be new, of the quality specified and free of any defects. Manufacturer's names are listed to establish a standard of quality and construction.
- B. The Contractor will be responsible for transportation of his materials to the job and for their storage and protection until the final acceptance of the job.
- C. Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds and all labor required for the safe and expeditious execution of his contract.

1.11 PERMITS AND INSPECTIONS

- A. The Contractor will be responsible for all permits and inspections required by law for the completion of his work. Cost of all permits and inspections shall be paid for by the Contractor. The Contractor shall obtain and pay for all certificates of approval which must be delivered to the Architect before final acceptance of the job. All materials and labor furnished by the Contractor shall be in strict accordance with the rules and requirements of the National Board of Fire Underwriters, state and municipal regulations and other authorities who may have lawful jurisdiction over the work being done.
- B. Each contractor shall be responsible for coordinating their work with the General

Contractor and scheduling AHJ required inspections through the General Contractor to allow inspections to be performed without impeding the progress of construction. Generally, the Contractor shall plan for inspections to occur two (2) weeks prior to the scheduled concealment of work in the area of inspection.

1.12 ENGINEERING DESIGN TEAM OBSERVATIONS

- A. Each contractor shall be responsible for coordinating their work with the General Contractor and scheduling progress observations through the General Contractor to allow for the following observations to be performed without impeding the progress of construction. Generally the Contractor shall plan for observations to occur two (2) weeks prior to the scheduled concealment of work in the area of observation.
- B. The minimum observations required for this project shall include but not be limited to:
 - 1. Rough Wall: All utilities, services and systems in-place including wall studs, cross bracing, supports, etc. (No sheetrock or insulation).
 - 2. Corrected Rough Wall: (Before Sheetrock).
 - 3. Above Ceiling: All utilities, services and systems in place, labeling on exposed piping (No insulation on piping systems. Ceiling grid/channels may be installed but no sheetrock or ceiling tile).
 - 4. Above Ceiling Final: All utilities, services and systems complete including hangers, insulation, and labeling (ceiling grid and/or channel may be in place but no sheetrock or ceiling tile shall be installed).
 - 5. Substantial Completion: All surfaces complete, fixtures installed and trim-out complete.
 - 6. Final: Cleaned and ready for occupancy.

1.13 EXAMINATION OF SITE

- A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon and therein. All proposals shall take into consideration conditions as may affect the work under this contract. They shall satisfy themselves as to existing grades and the actual formation, and soil conditions.
- B. They shall verify all service locations, depths, sizes, etc. No information given on the plans shall relieve the Contractor of this responsibility.

1.14 QUALITY ASSURANCE

- A. Perform Work in accordance with codes listed on the drawing sheets the local authority having jurisdiction (AHJ), and the Architect/Engineer. As the minimum standard for the level of quality, in all cases the greater quantity or better quality shall be the first consideration for the basis of an acceptable product or process. The local authority having jurisdiction, the Architect and the Engineer shall have the final authority on the approval and/or use of any product or process specified or submitted for substitution. The greater quality and/or value specified herein for the system(s) and various components and installation procedures shall take precedence over the minimum requirements of the

herein before mentioned codes.

- B. Equipment and Components: Bear UL and FM label or marking.
- C. Welding Materials and Procedures: Perform to ASME Code.
- D. Valves: Bear UL/FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Piping: All piping installed on this project shall bear the complete ASTM and Manufacturer's marking. Labeling and identification requirements as required by ASTM. All installed piping 5'-0" or greater in length shall be readily identifiable per ASTM labeling criteria. Piping not bearing this identification upon installation shall be removed and replaced by the correctly labeled piping. Piping shall not be re-stenciled after it is installed, to meet this requirement.

1.15 CONTROLS

- A. Where "automatic controls" are called for in the plans and specifications, all the control instruments, such as motorized valves, etc., shall be provided by the Contractor. The Drawings may show some power connections to controls equipment. However, if more power is required, then the Contractor shall provide this power.

1.16 UNIONS

- A. No unions are to be placed in any pipe in a location which will be concealed or inaccessible after completion of the building unless furnished with an access panel either as shown on the drawings or as specified herein. Unions must be installed on each side of all pieces of equipment such as heating/cooling equipment, coils, pumps, etc., so that such equipment may be readily disconnected in location that equipment can be disconnected and removed.

1.17 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.

- E. Interconnection of Instrumentation or Control Devices: Generally, electrical and pneumatic interconnections are not shown but must be provided.
- F. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- G. Electrical and Pneumatic Interconnection of Controls and Instruments: This is generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.
- H. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- I. Work in Existing Building: Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams.

1.18 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities will generally require temporary installation or relocation of equipment and piping.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining in service.
- D. Temporary equipment shall be provided when required by the phasing or called for specifically on the plans. The contractor shall maintain and operate temporary equipment or new equipment operated during construction strategically to provide desired indoor air conditions or for "dust" control.
- E. Temporary filters shall be provided throughout the entire construction period if the systems are operational. The frequency of replacement shall be directly related to the amount of airborne debris during the particular phase of construction. Different areas in different phases of the construction may require different frequencies of temporary filter replacement.
- F. Contractor shall keep building sealed weather tight if HVAC is turned 'ON' prior to substantial completion.

1.19 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor. Such access shall be provided without additional cost or time to the Owner. Where work

is in an operating facility, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the facility.

- B. In an operating facility, maintain the operation, cleanliness and safety. The Owner's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and facility operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of facility operation. Perform all flame cutting to maintain the fire safety integrity of this facility. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from the property expeditiously and shall not be allowed to accumulate.

PART 2 PRODUCTS

2.01 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and

model. Exceptions will be permitted if performance requirements cannot be met.

2.02 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.03 ESCUTCHEONS AND PLATES

- A. Where pipes or ducts pass through ceilings or walls in finished spaces, install sectional plates or escutcheons to cover the annular opening between pipe and sleeve. Solid plates with set screws shall be used where the sectional plates will not stay in place or are not available in the required size, or where other individual specification section(s) require one piece or greater quality escutcheons or plates.
- B. Inside diameter of escutcheons shall fit around insulation and around pipe or duct when not insulated; outside diameter shall cover sleeve. Secure escutcheons or plates to pipe or duct or sleeve but not to insulation. All escutcheons shall be triple nickel-chromium plated brass, or type 316L stainless steel.

2.04 INSULATION

- A. All insulation materials used inside the building on this project, including finishes and adhesives on the exterior surfaces of ducts, pipes and equipment shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less as determined by an independent testing laboratory in accordance with NFPA 255 as required by NFPA 90A, unless noted otherwise acceptable.

2.05 SOLENOID VALVES

- A. All solenoid valves used in hydronic systems shall be the slow acting type.

2.06 ASBESTOS

- A. Materials containing asbestos are not permitted.

PART 3 EXECUTION

3.01 ACCESS PANELS

- A. All valves, traps, drains, cleanouts, equipment, etc., must be accessible. The Contractor shall, wherever required to service his installation, coordinate size and location of access panels with General Contractor. Refer to Section 08 31 13 – Access Doors and Frames.

3.02 FIRESTOPPING

- A. Firestopping: Unused slots, sleeves and other penetrations in floors, walls or other general construction shall be closed and sealed with an approved firestopping material.
 - 1. Reference Section 07 84 00 – Firestopping for appropriate firestopping material required for each wall rating and penetration size and type.

2. Floor slots and openings shall be closed with 16 gauge galvanized steel sheet supported on 1-inch by 1-inch by 1/8-inch structural angle drilled or supported with powder-driven studs into the building structure. Firestop with a layer of silicone elastomer not less than 1-inch thick which completely fills the opening. The top surface of the silicone elastomer shall be approximately 1-inch below the finished floor slab.
 3. Openings in walls shall be closed with 16 gauge galvanized steel sheet securely attached at the midpoint of the wall thickness and firestopped on both sides of the steel sheet with not less than 1/8-inch thick layer of non-sagging silicone elastomer to fully cover the opening.
 4. Single or multiple pipes passing through walls and floors shall have the annular space between pipes or between pipes and structure filled with silicone elastomer to provide a rated firestop (rated to match the assembly) for floors and walls.
- B. Pipe and Ducts: The annulus between exposed pipe and ductwork and walls or floors in finished spaces shall be refilled, sealed and painted to match adjacent surfaces.
- C. Future Slots: Cap ends of sleeve and mark as future.

3.03 CUTTING AND PATCHING

- A. All cutting and patching of floors, walls and ceilings for installation of work covered in these sections will be done by the General Contractor.
- B. Where it becomes necessary to drill into or cut through any existing or completed floors, walls or ceilings to permit the installation of any work under this contract or to repair any defects that may appear up to the expiration of the guarantee, such cutting and patching shall be done by the General Contractor under the supervision of the Architect.
- C. No joists, beams, girders or columns shall be cut without first obtaining written permission from the Architect.
- D. All drilling methods for expansion bolts, hangers and other supports shall be done subject to be approval of the Architect. Labor and materials required to replace or rebuild parts or injured portions shall be furnished at the Contractor's expense, subject to the satisfaction of the Architect.

3.04 PAINTING

- A. Types of paint shall be as specified in the Architectural specifications. Surfaces to be painted are identified in Section 09 90 00 and the drawings.
- B. All surfaces to be painted shall be thoroughly cleaned, all rust scraped off and all oil and grease removed before any paint is applied.
- C. Finishing paint coats shall not be applied until all the work is completed. Cloths shall be spread where necessary to prevent drops of paint, oil, etc. from defacing walls, floors, etc., and the Contractor shall be held responsible for all damage by neglect of such precautions. The finished conditions of the painting shall be subject to the approval of the Architect, who may require retouching or repainting of surfaces not properly finished.

END OF SECTION