

University of Houston Master Specification

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SECTION 23 0100 – MECHANICAL GENERAL PROVISIONS

Maintain Section format, including the UH master spec designation and version date in bold in the center columns of the header and footer. Complete the header and footer with Project information.

Edit and finalize this Section, where prompted by Editor's notes, to suit Project specific requirements. Make selections for the Project at text identified in bold.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
 - 2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

1.2 DESCRIPTION OF WORK:

- A. General: This Division requires the furnishing and installing of all items Specified herein, indicated on the Drawings or reasonably inferred as necessary for safe and proper operation; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision, supplies, equipment, transportation, storage, utilities and all required permits and licenses. All work performed under this Section shall be in accordance with the Drawings and Specifications and subject to the terms and conditions of the Contract. For purposes of these Specifications, "provide" and "furnish and install" shall be synonymous. Owner's Representative (OR) shall refer to the individual designated by the Owner to receive and distribute correspondence with the Contractor.
- B. Work Included: This Work includes the furnishing of all labor, materials, equipment, fixtures, apparatus and appurtenances required for complete installation of operating heating, ventilating, air conditioning, plumbing and fire protection systems as specified, in place and ready for service. Refer to Section 23 0010, "Mechanical Scope of Work" and Division 23 for additional requirements.
- C. Drawings: Refer to the Mechanical Drawings for graphic representations, schedules, and notations showing mechanical work.
- D. Specifications: Refer to this Division for the primary technical specifications of mechanical work.

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- E. Work of Other Sections: Requirements given within this Section apply to the Work of all Sections of this Division. The actual performance of the Work stays within the Section in which it occurs; but subject to the requirements of this Section to the extent applicable.
1. **[Finish painting of mechanical systems in areas exposed to the view of building occupants is specified in other Divisions.]** All prime[, finished] and protective painting for all areas **[and finished painting of mechanical systems in areas not exposed to the view of building occupants]** shall be provided under this Division.
 2. Installation of electrical control power which is not specified as an integral part of equipment specified under this Division is specified under Division 26 and where shown on the Electrical Drawings. Necessary conduit, wiring, boxes, and fittings are specified under Division 26.
 3. Access doors in finished surfaces are **[provided under this Division and installed by the Contractor installing the finished surface.] [specified under other Divisions]**. Locations are as shown on the Drawings and as required for proper equipment access. **[Access panels shall be located on coordination drawings provided by this contractor and based on final equipment locations and access requirements.]**
 4. Concrete housekeeping pads and supporting structures are specified under **[other] [this]** Division[s]. **[Dimensions and locations of pads and supports shall be the responsibility of this Division.] [Housekeeping pads shall be located on coordination drawings provided by this contractor and based on actual equipment being furnished and final equipment locations.]**
 5. Pits for sewage ejectors, storm water, and other pumps are specified in other Divisions. Dimensions and locations of pits shall be the responsibility of this Division.
 6. Subsurface drainage up to and including pump pits is the responsibility of other Divisions.
 7. Owner and General Contractor-furnished equipment is furnished and installed under other Divisions. Proper HVAC and Plumbing provisions, including rough-in and final equipment connections, are included in the Work of this Division.
 8. Motors for all equipment shall be furnished and installed with the equipment furnished by this Contractor. Refer to Section 23 04 00, "Motors and Controllers", for additional information.
 9. Motors and motor starters that are an integral part of the equipment are furnished under this Division with the driven equipment; all other motor starters, electrical wiring and connections are included in the Work of Division 26. Refer to Section 23 04 00 for additional information.
 10. Standby engine-driven emergency generator exhaust piping shall be furnished, installed and insulated under this Division. Exhaust silencer(s), flexible exhaust connector(s), ventilated exhaust thimble(s) and condensation trap(s) shall be installed and insulated (as required) under this Division. The exhaust silencer(s), flexible exhaust connector(s), and ventilated thimble(s) shall be furnished by Division 26.
 11. Standby engine-driven emergency generator cooling supply and exhaust air ductwork and dampers shall be furnished and installed under this Division. Engine generator set-mounted closed-circuit radiator and engine-driven fan shall be furnished under Division 26.
 12. Building Controls and Automation are provided under Division 25. Refer to Section 23 0010 for Division 23 interface requirements.
- F. Workmanship: All mechanical and plumbing work shall be constructed and finished in every respect in a workmanlike and substantial manner. Furnish and install all work as may be necessary to complete systems in accordance with the best trade practice and to the satisfaction of the Owner and Engineer. The entire installation shall be ready in every respect for satisfactory and efficient

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operation when completed. The Owner and Engineer will interpret the meaning of the Drawings and specifications and will reject all work and materials which, in their judgment, are not in full accordance therewith.

- G. **Certification:** Submit a single certification stating that all portions of the work are in accordance with contract requirements. Warranty all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by the Owner, except that where guarantees or warranties for longer terms are specified by contract, such longer term shall apply. At no additional cost to Owner, within 24 hours after notification, correct any deficiencies which occur during the warranty period, to the satisfaction of the Owner.
- H. **Safe Work Place:** The Contractor covenants and agrees that he and his Subcontractors and his and their agents and employees will provide and maintain a safe place to work and will comply with all laws and regulations of any governmental authorities having jurisdiction thereof, and the contractor agrees to indemnify, defend and hold harmless, the Engineer and Owner from and against any liability, loss, damage or expense, including attorneys' fees, arising from a failure or alleged failure on the part of the contractor, his subcontractors and his and their agents and employees to provide and maintain a safe place to work or to comply with laws and regulations of governmental authorities having jurisdiction thereof.
- I. **Indemnification:** The Contractor and each Subcontractor covenants and agrees to indemnify, defend and hold harmless the Engineer and Owner against any liability, loss, damage or expenses, including reasonable attorneys' fees, arising from a failure or alleged failure on the part of the contractor, his subcontractor or his or their agents and employees properly to discharge the obligations assumed by him or them in the performance of the work, including any act or omission allegedly resulting in death or personal injury or property damage on improper construction, construction techniques, or the use of improper or inappropriate material or tools.
- J. **[System Downtime: This building is a 24-hour research/classroom/office facility and any shutdown of the supply and exhaust systems or interruption of utility service will be strictly enforced and number of shutdowns must be minimized. Any required shutdowns must be scheduled during weekday evening hours of a duration no longer than 10 consecutive hours, during weekends from 6 PM Friday till 5 AM Monday morning, or as agreed in writing with the OR. Only one power system may be shut down at a time unless required by work on a common item of service and specifically scheduled with the OR. Shutdown of power systems is extremely critical and must be coordinated with the OR before any scheduled shutdown. A detailed schedule of activities and system shutdowns is critical and must be submitted to and coordinated with the OR within two weeks of the award of contract. Primary system shutdowns shall be scheduled a minimum of two weeks in advance and reconfirmed 72 hours prior to shutdown. The agreed schedule shall be posted in the penthouse and the scheduled shutdown date shall be posted on each piece of equipment and in the affected laboratories. Refer to phasing notes on Drawings for additional requirements.]**
1. **[Minimize noise and vibrations within the work space since it is likely that research will continue in all surrounding spaces. Work that requires loud noise or noticeable vibration must be scheduled with the Owner.]**
 2. **[Dust and dirt are extremely detrimental to research in adjacent spaces. All duct removal process shall minimize the spread of dirt and dust from the materials removed by isolating the project area from its surroundings.]**
 3. **[A schedule shall be submitted by the Contractor and subsequently reviewed by the Owner, including building users, to determine acceptance or alternative scheduling. All cleaning,**

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treating and coating work shall be undertaken by the Contractor using means and methods that minimize odors during working hours.]

K. Project Completion: All bid submissions, coordination schedules and project staffing shall be based on the critical path to meet the scheduled project completion time.

1.3 CODES, PERMITS AND FEES:

A. General: The University of Houston complies with state and local codes, and regulatory requirements as listed in the UH Design Guidelines and Standards, Section 12, p2, Facility Performance a.3.b.

B. Codes and Standards: All work shall be done in full compliance with all applicable state and local codes, requirements and ordinances and applicable requirements of NFPA, UL and other applicable standards.

C. Industry Standards: All equipment and materials shall be new and listed by the Underwriters' Laboratories, Inc., and manufactured in full accordance with applicable ASME, NEMA, ANSI or IEEE standards.

D. Approvals, Permits and Inspections: Secure and pay for all necessary approvals, permits, inspections, etc., and deliver the official records of the granting of permits to the Owner without additional cost to the Owner.

E. Code Design Basis: The following codes and ordinances were used in the design of the project and shall be complied with during construction of the project.

1. Building Code - [_____, _____ Edition.]

2. Fire Code - [_____, _____ Edition.]

3. Electrical Code- [_____, _____ Edition.]

4. Mechanical Code- [_____, _____ Edition.]

5. Plumbing Code- [_____, _____ Edition.]

6. Energy Code- [_____, _____ Edition.]

7. Accessibility Code- Texas Accessibility Standards (TAS)/Americans with Disabilities Act of 1990.

F. Precedence: Where Contract Document requirements are in excess of Code requirements and are permitted under the Code, the Contract Documents shall govern. None of the terms or provisions of the Drawings or specification shall be construed as waiving any of the rules, regulations or requirements of these authorities. In the event of conflict between the Contract Documents and the local enforcing authority, the latter shall rule. Any modifications resulting therefrom shall be made without additional cost to the Owner or Engineer. This Contractor shall report any such modifications to the Engineer and secure his approval before proceeding.

1.4 QUALITY ASSURANCE AND STANDARDS:

A. Materials/Methods: Manufacturers, materials, and methods described in the various sections of the Specifications, and indicated on the Drawings are intended to establish a standard of quality only. It is not the intention of the Engineer to discriminate against any product, material or method that is equal to the standards as indicated and/or specified, nor is it intended to preclude open, competitive bidding. The fact that a specific manufacturer is listed as an acceptable manufacturer should not be interpreted to mean that the manufacturer's standard product will meet the requirements of the project design, Specifications and space constraints. **The Engineer will be the sole judge of quality and equivalence of equipment, materials and methods.**

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- B. Alternative Products/Materials/Methods: Products by other reliable manufacturers, other materials and other methods may be accepted provided they have equivalent capacity, construction and performance. **Under no circumstances shall any substitution be made without the prior written approval of the Engineer and Owner.** Wherever a definite product, material or method is specified and there is not a statement that another product, material or method will be acceptable, it is the intention of the Engineer that the specified product, material or method is the only one that shall be used without prior approval. Wherever a definite material or manufacturer's product is specified and the Specification states that products of similar design and equal construction from the specified list of manufacturers may be provided, it is the intention of the Engineer that products of manufacturers that are specified are the only products that will be acceptable and that products of other manufacturers will not be considered for substitution without prior written approval. Refer to Section 01 2500 "Substitution Procedure" for further information.
- C. Alternative Equipment: Where substituted or alternative equipment is used on the project, it shall be the responsibility of the Contractor or Subcontractor involved to verify that the equipment will fit in the space available, including all required Code and maintenance clearances, and to coordinate all equipment requirements and provisions with the Mechanical (HVAC) and Plumbing Design and all other Contractors.
- D. Standards: Refer to Division 1 for general administrative/procedural requirements related to compliance with applicable standards. This Work and all materials shall meet the standards set forth in the applicable portions of the following recognized standards:
1. ADC Air Diffusion Council.
 2. AGA American Gas Association.
 3. AMCA American Movement and Control Association.
 4. ANSI American National Standards Institute.
 5. ARI American Conditioning and Refrigeration Institute.
 6. ASHRAE American Society of Heating, Refrigerating & Air-Conditioning Engineers.
 7. ASME American Society of Mechanical Engineers.
 8. ASPE American Society of Plumbing Engineers.
 9. ASSE American Society of Sanitary Engineering.
 10. ASTM American Society for Testing and Materials.
 11. AWS American Welding Society.
 12. AWWA American Water Works Association.
 13. CDA Copper Development Association.
 14. **[CE Corps of Engineers (US Department of the Army).]**
 15. CISPI Cast Iron Soil Pipe Institute.
 16. ETL Electrical Testing Laboratory.
 17. FM Factory Mutual Engineering Corporation.
 18. FS Federal Specification (General Services Administration).
 19. IRI Industrial Risk Insurers.
 20. MCAA Mechanical Contractors Association of America.
 21. **[MIL Military Standardization Documents (U.S. Department of Defense).]**

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- 22. MSS Manufacturers Standardization Society of the Valve and Fittings Industry.
- 23. NEC National Electrical Code (by NFPA).
- 24. NEMA National Electrical Manufacturers Association.
- 25. NFPA National Fire Protection Association.
- 26. OSHA Occupational Safety Health Administration (US Department of Labor).
- 27. PDI Plumbing and Drainage Institute.
- 28. SMACNA Sheet Metal & Air Conditioning Contractors' National Association.
- 29. UL Underwriters' Laboratories, Inc.

1.5 SITE VISIT AND FAMILIARIZATION:

- A. General: Become familiar with the Drawings and Specifications, examine the premises, and understand the conditions under which the Contract shall be performed, prior to submitting a bid.
- B. Site: Be informed of the site conditions, verify locations of new and existing equipment, and determine exact requirements for connections.
- C. Coordination: Submission of a bid for this project infers that the Contractor has visited the site and has become familiar with the Drawings and site conditions and has included in his proposal, all work necessary to properly install the systems on the project.
- D. Pre-Bid Conference: Refer to Division 1.

1.6 DRAWINGS AND SPECIFICATIONS:

- A. General: The Drawings are schematic in nature and indicate approximate locations of the heating, ventilating and air conditioning systems, plumbing equipment, fixtures and piping systems, except where specific locations are noted and dimensioned on the Drawings. All items are shown approximately to scale. The intent is to show how these items shall be integrated into the construction. Locate all items by on the job measurements and in accordance with the Contract Documents. Cooperate with other trades to ensure project completion as indicated.
- B. Location: Prior to locating diffusers, grilles, other exposed air devices, plumbing fixtures, fire hose cabinets, and plumbing items, obtain the Engineer's approval as to exact location. Locations shall not be determined by scaling Drawings. Mount plumbing fixtures, fire hose racks, and cabinets at the heights directed by the Engineer. Contractor shall be responsible for costs of redoing work of trades necessitated by failure to comply with this requirement.
- C. Specifications: The specifications are intended to supplement the Drawings and it is not in the scope of the specifications to mention any part of the work which the Drawings are competent to fully explain. Conversely, any part of the work which the specifications are competent to fully explain, may not be mentioned on the Drawings.
- D. Disagreement: Disagreement between the Drawings or specifications or within the Drawings or specifications shall be estimated using the better quality or greater quantity of material or installation, and a request for information shall be made in writing to the Engineer.

1.7 DISCREPANCIES:

- A. Clarification: Clarification shall be obtained before submitting a proposal for the Work under this Division as to discrepancies or omissions from the Contract Documents or questions as to the intent thereof. All questions and requests for clarifications shall be submitted in writing to the Engineer.

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- B. Detailed Instructions: Should it appear that the work hereby intended to be done or any of the materials relative thereto, is not sufficiently detailed or explained in the Drawings or Specifications, then the Contractor shall apply to the Engineer for such further Drawings or explanations as may be necessary, allowing a reasonable time for the Engineer to respond. The Contractor shall conform to this additional information as a part of the Contract without additional cost to the Owner or Engineer.
- C. Interpretations: Should any doubt or question arise respecting the true meaning of Drawings or Specifications, reference shall be made to the Engineer, whose written decision shall be final and conclusive. No alleged statement by the Engineer will be accepted as an excuse for inferior work.
- D. Contractor Agreement: Consideration will not be granted for misunderstanding of the amount of work to be performed. Submission of a bid conveys full Contractor agreement of the items and conditions specified, shown, scheduled, or required by the nature of the project.
- E. Discrepancy Notification: Immediately notify engineer in writing when existing field conditions differ from the conditions shown on the contract documents.

1.8 SAFETY REGULATIONS:

- A. General: All electrical work shall be performed in compliance with all applicable and governing safety regulations. All safety lights, guards, signs, and other safety materials and provisions required for the performance of the mechanical work shall be provided by and operated by the Mechanical contractor.
- B. OSHA: It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of Public Law 91596, 29 U.S.C. Secs. 651 et seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto, and to enforce and comply with all of the provisions of this Act.
- C. Emergencies: In any emergency affecting the safety of persons or property, the Contractor shall act, at its direction, to prevent threatened damage, injury or loss.

1.9 UTILITIES:

- A. General: Utility information shown on the Drawings has been shown based upon data obtained from the site survey and the agencies having jurisdiction and are accurate to the best of the knowledge of the Engineer.
- B. Coordination: The Contractor shall be responsible for field verification of the actual location of site and/or building utilities and shall make modifications necessary for connection to or construction around those utilities at no additional cost to the Owner or Engineer.
- C. Relocation: Allow for relocation of "x" conduit, "y" pipe as indicated in the drawings.

1.10 CHANGE ORDERS:

- A. General: Refer to Uniform General Conditions and Division 1 for requirement concerning Change Orders.

1.11 ALTERNATES:

- A. General: Refer to Division 1 for information concerning Alternates. **[A summary of alternates which affect the work of this Division is as follows:]**
 - 1. **[Alternate No.]**
 - 2. **[Alternate No.]**

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3. [Alternate No.]

1.12 UNIT PRICES:

- A. General: Refer to Division 1 for information concerning Unit Prices that are part of the Project bid.

1.13 PRECONSTRUCTION CONFERENCE:

- A. Conference: Upon the award of this Contract and prior to commencing any work, the Contractor and his designated major subcontractors shall confer with the Architect, Engineer and Owner concerning the Work under this Contract. The conference shall be at a mutually agreeable place and time.

1.14 SITE OBSERVATION:

- A. General: Observation at the site to verify general compliance with Contract Documents will be made periodically by the Engineer or his representative. Written observation comments will be submitted to the General Contractor for review and a written response.
- B. Notification: Contractor shall contact Engineer at project milestones so that Engineer can schedule site visits after most of the mechanical and plumbing installation is complete, but before the installations are covered by ceilings, walls, etc.

1.15 REQUESTS FOR INFORMATION (RFI):

- A. Comply with requirements of Section 01 3100 "Project Management and Coordination."

1.16 PROJECT STATUS REPORTS:

- A. General: Provide a weekly written progress report, coordinated with all trades, to keep the owner informed of the project progress. This report will be enforced and shall be submitted to the OR and include:
1. Project status and activities for the prior week.
 2. Schedule update highlighting all variations from the owner approved schedule.
 3. A status report for all documents required by the project (submittals, RFI, reports, change order requests, etc.).

1.17 SUBMITTALS:

- A. General: Submittals required for this project shall include, but not be limited to:
1. Shop Drawings and Product Brochure Submittals.
 2. Certifications and Test Reports.
 3. Operating and Maintenance Manuals.
 4. Warranties (Guarantees).
- B. Additional Requirements: Refer to Division 1 for additional submittal requirements.
- C. Shop Drawings and Product Brochure Submittals: The terms "Submittal" and "Shop Drawing" in this Specification are defined as either product literature, samples of equipment or actual Shop Drawings.
- D. Submittal Schedule: The Contractor shall provide a Schedule of Submittals to the Engineer within two weeks of bid award. This document shall list the submittal number and name for all required submittals for the project and shall include the proposed date on which each required initial submittal will be issued to the Engineer and Owner for review. The schedule shall allow adequate time to complete the submittal process at times appropriate to the construction schedule while allowing for delivery time to and from the Engineer and Owner and for Engineer and Owner review

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time. The schedule shall also allow for submittal resubmissions and related delivery and Engineer and Owner review time, as may be required. The Engineer shall not be held responsible for delays or costs incurred due to excessive Shop Drawing review time where the initial submittal is received after the scheduled issue date or is not in compliance with submittal requirements contained herein.

- E. Submittal Log: The Contractor shall compile and maintain a Submittal Status log which shall be transmitted to the Engineer on a weekly basis in either hardcopy or e-mailed electronic format.
- F. Submittal Copies: The Contractor shall forward electronic copies of each submittal to the Architect, Owner and Engineer. The Architect and Owner will retain their submittal review copies for their files. The Engineer will retain one submittal review copy and will return the completed submittal review to the Contractor, via the Architect or Owner as applicable. The Contractor shall submit additional submittal copies to the Engineer as required for the Contractor's use, including the one copy of each final approved submittal that the Contractor is required to include in the project O&M manuals. Where an alternate submittal review process such as electronic submittal review comments is to be used on a project, then the submittal procedures for that process will be determined and documented at the pre-construction conference.
- G. Shop Drawings and Product Brochure Submittal Requirements: The Contractor shall prepare complete submittals that include all pertinent information about the product. **A single Shop Drawing shall not contain information from more than one Specification section, but a single Specification section may be subdivided into separate submittals for items or equipment that are specified in that section.** Shop Drawings shall be separately assembled by complete or partial Specification section. Where a single Shop Drawing contains information from more than one Specification section, it will be marked "REVISE AND RESUBMIT" and returned. Shop Drawings that do not comply with the above requirements will be marked " REVISE AND RESUBMIT " and returned to the Contractor:
1. Cover Sheet: The cover sheet shall include the Project Name and the names and addresses of the Owner, Project, Architect, M/E/P Engineer, General Contractor and the Subcontractor making the submittal. The cover sheet shall also contain the Specification section number applicable to the item or items submitted, the item nomenclature and description and the submittal number. HVAC, plumbing and fire protection submittals shall be numbered sequentially by Specification section with a sequence suffix (e.g. 23 3113-1, 23 3113-2, 23 3114-1, etc.). Resubmittals shall be numbered with the original submittal number plus an R in the sequence suffix (e.g. the resubmittals of submittal 23 3113-1 would be 23 3113-1R1, 23 3113-1R2, ...).
 2. Index: The index page shall include a listing of all data included in the submittal.
 3. List of Variations: This page shall list all variations, including unfurnished or additional items or features between the submitted equipment and the specified equipment. If there are no variations, then this page shall state "No Variations". Where variations affect the work of other contractors, then the Contractor shall certify on this page that these variations have been fully coordinated with the affected contractors and that all additional costs to the affected contractors associated with the variations shall be paid by the submitting Contractor.
 4. Specification Review: A copy of the appropriate specification section shall be included in the submittal with each specification paragraph marked in the right margin with a "C" for Submitted Product/Material/Installation Complies or an "N" for Submitted Product/Material/Installation Not in Compliance. All paragraphs marked with a "N" shall be specifically addressed in the Submittal List of Variations.

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- 5. Equipment Information: Submittal shall include equipment information including manufacturer's name and designation, size, performance and capacity data. All applicable listings, labels, approvals and standards shall be clearly indicated.
 - 6. Dimensional Data: Submittal shall include dimensional data and actual sketches as applicable to show that the submitted equipment will fit the space available with all required Code and maintenance clearances.
 - 7. Identification Information: Submittal shall include Identification/designation for each item of material or equipment matching that indicated in the Specifications or on the Drawings.
 - 8. Product Data: Submittal shall include sufficient pictorial, descriptive and diagrammatic data on each item to show its conformance with the Drawings and Specifications. Any options or special requirements shall be so indicated. All applicable information shall be clearly indicated with arrows or another approved method. Any non-applicable information shall be crossed out.
 - 9. Contractor Certification: Submittal shall include certification by the General Contractor and Subcontractor that the material submitted is in accordance with the Contract Documents, signed and dated.
 - 10. Manufacturer Certification: Where specified, submittals shall include reports or information requiring certification which shall be certified by an authorized officer of the manufacturer or testing agency.
 - 11. Certified Shop Drawings: Submittals shall include Certified Shop Drawings showing dimensions, loading details, anchor bolt locations and inserts required for each piece of equipment set on concrete in sufficient time to cause no delay in the Work.
 - 12. Equipment/Material Data: Equipment and material submittals shall show sufficient data including all performance curves, sound data, recommended installation details, and sufficient data to indicate complete compliance with the Contract Documents, including proper sizes, clearances, capacities, materials, and finishes.
 - 13. Additional Information: Submittal shall include additional information as required in other sections of this Division.
- H. Required Shop Drawing Submittals: Submit Shop Drawings, including, but not limited to the following items: **[EDIT LIST TO SUIT PROJECT]**
- 1. **Schedule of Submittals** **Refer to Section 23 0100.**
 - 2. **Testing, Adjustment and Balancing** **Refer to Section 23 0593.**
 - a. **Before starting the actual Test and Balance procedure submit:**
 - Personnel qualifications.**
 - Equipment to be used on the project.**
 - Testing and Balancing Forms.**
 - 3. **Basic Materials and Methods** **Refer to Section 23 0300.**
 - 4. **Pipe Heat Tracing** **Refer to Section 23 0405.**
 - 5. **Electronic Variable Speed Drives** **Refer to Section 23 0510.**
 - 6. **Motors and Controllers** **Refer to Section 23 0400.**
 - 7. **System Insulation** **Refer to Section 23 0700.**
 - 8. **Vibration Isolation** **Refer to Section 23 0548.**
 - 9. **Plumbing Pumps** **Refer to Section 22 1000.**

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10. Electric Water Heaters	Refer to Section 22 1200.
11. House/Break Tanks	Refer to Section 22 1300.
12. Water Treatment Equipment	Refer to Section 23 2500.
13. Plumbing Piping Systems	Refer to Section 22 1020.
14. Plumbing Valves and Accessories	Refer to Section 22 1010.
15. Plumbing Fixtures and Trim	Refer to Section 22 3000.
16. Floor, Area and Roof Drains	Refer to Section 22 4000.
17. Fire Protection System	Refer to Section 21 1200.
18. Wet-Pipe Fire Sprinkler System	Refer to Section 21 1313.
19. Fire Protection Pumps	Refer to Section 21 3000.
20. HVAC Pumps	Refer to Section 23 3000.
21. HVAC Piping Systems	Refer to Section 23 2000.
22. HVAC Piping Valves and Accessories	Refer to Section 23 2010.
23. HVAC Water Treatment	Refer to Section 23 2500.
24. Heat Exchangers	Refer to Section 23 1200.
25. Custom Air Handling Units	Refer to Section 23 7420.
26. HVAC Coils	Refer to Section 23 8216.
27. Fans, Air Intakes and Relief Vents	Refer to Section 23 8220.
28. HVAC Terminal Units	Refer to Section 23 3600.
29. Ductwork	Refer to Section 23 3113.
30. Ductwork Accessories	Refer to Section 23 3114.
31. Air Distribution Devices	Refer to Section 23 3713.
32. Filters and Accessories	Refer to Section 23 4113.
33. Building Controls	Refer to Section 23 0600.
34. Coordination Drawings	Refer to Section 23 0100.

- I. Samples: Submit two samples, upon request, of mechanical/plumbing devices and materials for review by the Architect/Engineer. Samples will be returned upon written request of the Contractor.
- J. Fabrication Drawings: Fabrication Drawings shall be made at no additional charge to the Owner or the Architect/Engineer. Submit Fabrication Drawings whenever:
1. Equipment proposed varies in physical size and arrangement from that indicated on the Drawings, thus causing rearrangement of equipment space.
 2. Where tight spaces require extreme coordination between ductwork, piping, conduit and other equipment.
 3. Where called for elsewhere in these Specifications.
 4. Where specifically requested by the Architect/Engineer.
- K. Equipment List: Within thirty days after the date of contract award or work order, whichever is later, and before purchasing or starting installation of materials or equipment, the Contractor shall submit for review, a complete list of suppliers, contractors and manufacturers for all materials and

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equipment which will be submitted for incorporation into the project. The list shall be arranged in accordance with the organization of the Specifications.

1. This initial list shall include the manufacturer's name and type or catalog number as required to identify the quality of material or equipment proposed.
 2. This initial list shall include the proposed submittal schedule to allow the design team to schedule the required time for reviews.
 3. This list will be reviewed by the Engineer and the Owner and will be returned to the Contractor with comments as to which items are acceptable without further submittal data and which items will require detailed submittal data for further review and subsequent approval.
 4. The initial list shall be submitted as herein specified. Materials and equipment requiring detailed submittal data shall be submitted with sufficient data to indicate that all requirements of these Specifications have been met and samples shall be furnished when requested. All manufacturer's data used as part of the submittal shall have all inapplicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.
- L. Shop Drawing Submittal Review: Shop Drawings will be reviewed for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown in review comments is subject to the requirements of the Contract Documents. The submitting Contractor is responsible for: dimensions to be confirmed at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades; and the satisfactory performance of work.
1. The Engineer will endeavor to provide Shop Drawing review time in the Engineer's office of two weeks per review, exclusive of transmittal time, and this review time shall be considered by the Contractor when scheduling his work on the project. Submittals received outside the scheduled delivery dates may require additional time for review.
 2. The Architect's review or approval and the Engineer's review of Shop Drawings shall not relieve the Contractor of the responsibility for errors, omissions or deviations that may be contained in the submittals. If the Contractor proceeds on the basis of undetected errors, omissions or deviations in reviewed Shop Drawings, it shall be at his sole responsibility and the review does not allow deviations from the requirements of the Contract Documents. Noting some errors, omissions, and deviations but overlooking other errors, omissions, and deviations does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawing or the Engineer's review thereof, the Contract Documents shall govern the Work and are neither waived or superseded by the Shop Drawing review.
 3. It shall be the responsibility of the submitting Contractor to check all equipment and materials for conformance with the Contract Documents and a "REVIEWED WITH NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" submittal at the time such equipment and materials are delivered to the job site, and to notify the Engineer of any deviations.
 4. Inadequate or incomplete Shop Drawings will not be reviewed by the Architect or the Engineer and will be returned to the Contractor marked "REVISE AND RESUBMIT" for completion and resubmittal.
 5. Shop Drawings will be marked "REVIEWED WITH NO EXCEPTIONS TAKEN", "MAKE CORRECTIONS NOTED AND SUBMIT WRITTEN RESPONSE", "REVISE AND RESUBMIT", or "REJECTED" when reviewed by the Engineer. The definitions of these terms for submittal review purposes is as follows:

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- a. **REVIEWED WITH NO EXCEPTIONS TAKEN** - The Shop Drawing was reviewed and no exceptions from the general conformance with the design concept and general compliance with the information given in the Contract Documents were noted.
 - b. **MAKE CORRECTIONS NOTED AND SUBMIT WRITTEN RESPONSE** - The Shop Drawing was reviewed and found to have either minor deviations from the requirements of the Contract Documents or information missing from the submittal, as noted. A complete Shop Drawing resubmittal is not required, however, a written response to all review comments shall be submitted in the format used for a resubmittal.
 - c. **REVISE AND RESUBMIT** - The Shop Drawing was reviewed and major deviations from general conformance with the design concept and general compliance with the information given in the Contract Documents were observed, as noted. The Shop Drawing shall be revised to eliminate the deviations noted and resubmitted.
 - d. **REJECTED** - The Shop Drawing was reviewed and is not in general conformance with the design concept or in compliance with the information given in the Contract Documents, as noted. A revised Shop Drawing submittal for the specified equipment or materials shall be resubmitted.
6. Division 1 and General Conditions requirements concerning Shop Drawing submittal review are not applicable to this Division.
 7. Materials and equipment which are purchased or installed without an "REVIEWED WITH NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" Shop Drawing review shall be at the risk of the Contractor and the cost for removal and replacement of such materials and equipment and related work which is judged unsatisfactory by the Architect/Engineer for any reason, shall be at the expense of the Contractor.
 8. Shop Drawings shall be complete and checked prior to submission to the Engineer for review. **Where more than two reviews are required for a given Shop Drawing to reach "REVIEWED WITH NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED AND SUBMIT WRITTEN RESPONSE" status, the Contractor may be invoiced for additional review services at a cost of \$150.00 per hour for review of the third and subsequent submittals.** If the Contractor fails to pay any legitimate additional review services invoice in full within 30 days, then that invoice will be forwarded to the Architect/Owner requesting to withhold payment of the amount invoiced from the next General Contractor's request for payment, as allowed for under the Owner-Contractor Agreement and Construction Manager-At-Risk Agreement. Incomplete submittals will be returned to the Contractor unchecked.
- M. Certifications and Test Reports: The Engineer may, at their option, witness any or all of the on and off-site acceptance and operational testing. Submit a detailed listing of certification and testing for each system indicating estimated dates for completion of system installation. This listing of certification and testing shall be submitted at least 30 days before any testing is conducted.
1. Test procedures and test result reporting forms shall be submitted for review no later than the date of the certification and testing listing submittal.
 2. Notify the Engineer in writing two weeks prior to any scheduled testing to allow time for Engineer to schedule witnessing of testing, where elected by the Engineer.
 3. Submit six copies of all certifications and test reports to the Engineer for review adequately in advance of completion of the Work to allow for remedial action as required to correct deficiencies discovered in equipment and systems.

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4. Certifications and test reports to be submitted shall include, but not be limited to those items outlined in Section 23 0593 "Testing, Adjusting and Balancing".

N. Operating and Maintenance Manuals:

Hard copies: Submit two copies of Operating and Maintenance Manuals to the Engineer for approval prior to the beginning of operator training. Provide four approved Operating and Maintenance Manuals for use in operator training. Manuals shall be bound in rigid cover, 3-ring binders with spine and cover labels and shall provide operating and maintenance information for every piece of equipment furnished under this Specification. All sections shall be typed and indexed into sections and labeled for easy reference. Bulletins containing information about equipment which is not installed on the project shall be properly marked up or stripped and reassembled. All pertinent information required by the Owner for proper operation and maintenance of equipment supplied by Division 23 shall be clearly and legibly set forth in memoranda which shall, likewise, be bound with bulletins.

Electronic copies: Submit an additional copy of information described above in electronic format.

At a minimum, the following information shall be provided as applicable:

1. Complete description of each system, item of equipment, and apparatus provided under this Division, including ratings, capacities, performances, data and curves, characteristics identifying name and number, locations, and wiring diagrams, including sources for all parts.
2. Fully detailed parts lists, including all numbered parts and recommended spare parts, of each item of equipment and apparatus provided under this Division.
3. Manufacturer's printed instructions describing operation, service, maintenance, and repair of each item of equipment and apparatus.
4. Typewritten record of tests made of materials, equipment, and systems included under this Division. Such records shall state the dates the tests were conducted, name(s) of person(s) making and witnessing the tests, and citing any unusual conditions relevant to the tests. Temperature control wiring diagrams complete with instructions outlining each sequential step in the start-up and shutdown of the heating/cooling system. Include precautions and instructions for servicing each item of the system.
5. Identifying names, name tags designations and locations for all equipment.
6. Valve tag lists with valve number, type, color coding, location and function.
7. Equipment and motor nameplate data.
8. Copies of all approved Shop Drawing submittals and testing and balancing reports.
9. Fabrication drawings.
10. Equipment and device bulletins and cutsheets clearly highlighted to show equipment installed on the project and including performance curves and data as applicable.
11. Maintenance instructions clearly highlighted to show all required periodic maintenance and lubrication.
12. Wiring diagrams.
13. Operating instructions clearly highlighted to show proper operating procedures for all equipment.

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- 14. Exploded parts views and parts lists for all equipment and devices.
- 15. Color coding charts for all painted equipment and conduit.
- 16. Location and listing of all spare parts and special keys and tools furnished to the Owner.
- O. Tools: Provide and deliver to the Owner's authorized representative any special tools required for maintenance of systems, equipment, and apparatus installed under this Division prior to requesting final acceptance of the installation.

1.18 PROJECT RECORD DOCUMENTS:

- A. Site Prints: Maintain a set of clearly marked black line prints of the Contract Drawings at the job site which shall be used for recording the work details, final size, location, interrelation, and similar items of all work under this Division. This set of Drawings shall be corrected daily as the Work progresses and shall clearly indicate all changes to suit field conditions, changes made by "Field Order" or "Change Order", accurate dimensions of all buried or concealed work, precise locations of all concealed work, locations of all concealed valves, controls and devices and any deviations from the work shown on the Drawings that are required for coordination. All dimensions shall be to at least two permanent structure points.
- B. Upon completion of the work, the Contractor shall transfer all marks from the site prints to a set of reproducible record "as-built" Drawings using red ink. The reproducible record "as-built" Drawings shall have the Engineer's name and seal removed or blacked out and shall be clearly marked and signed on each sheet as follows:

CERTIFIED AS-BUILT DRAWINGS

DATE: _____

(NAME OF GENERAL CONTRACTOR)

BY: (SIGNATURE)

(NAME OF SUBCONTRACTOR)

BY: (SIGNATURE)

- C. Approval: Prior to final acceptance of the Work of this Division, the Contractor shall submit one electronic and two black line prints of properly certified As-Built Drawings to the Engineer for review and shall make changes, corrections, or additions as the Engineer may require to the As-Built Drawings.

1.19 COORDINATION OF MECHANICAL WORK:

- A. General: Refer to Division 1 for general coordination requirements applicable to the entire work. It is recognized that the Contract Documents are diagrammatic in showing certain physical relationships that must be established within the mechanical work, and in its interface with other work including utilities and electrical work and that such establishment is the exclusive responsibility of the Contractor. The Drawings show diagrammatically the sizes and locations of the various ductwork and piping systems and equipment items and the sizes of the major interconnecting ducts and pipes, without showing exact details as to elevations, offsets, control lines, and installation details.

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1. Arrange mechanical work in a neat, well organized manner with services running parallel with primary lines of the building construction and with a minimum of 7 feet overhead clearance where possible.
2. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to avoid obstructions and to provide proper grading of lines. Exact locations of outlets, apparatus and connections thereto shall be determined by reference to detail Drawings, equipment Drawings, roughing-in Drawings, etc., by measurements at the building and in cooperation with other Contractors and in all cases shall be subject to the approval of the Engineer. Relocations necessitated by the conditions at the site or directed by the Engineer shall be made without any additional cost to the Owner or Engineer.
3. All ducts and pipes except those in the various equipment rooms, in unfinished spaces or where specifically designated herein or on the Drawings shall be run concealed in furring, plenums and chases. Wherever conditions exist which would cause any of these items to be exposed in finished spaces, the Contractor whose work is involved shall immediately call the situation to the attention of the Engineer and shall stop work in those areas until the Owner's Representative or General Contractor directs the resumption of the work. Submit for approval a Shop Drawing for any change in piping, equipment placement, ductwork, etc.
4. Equipment has been chosen to fit within the available space with all required Code and maintenance clearances and shall be installed as shown. Every effort has been made to also accommodate equipment of other approved manufacturers, however since equipment and access space requirements vary, the final responsibility for installation access and proper fit of substituted equipment rests with the Contractor.
5. Piping interferences shall be handled by giving precedence to pipe lines which require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall, in general, be observed:
 - a. Building lines.
 - b. Structural members.
 - c. Soil and drain piping.
 - d. Steam and condensate piping.
 - e. Sprinkler piping.
 - f. Vent piping.
 - g. Supply ductwork.
 - h. Exhaust ductwork.
 - i. Chilled water and heating hot water piping.
 - j. Domestic water piping.
 - k. Electrical conduit.
6. Locate operating and control equipment properly to provide easy access. Arrange entire mechanical work with adequate access for operation and maintenance.
7. Advise other trades of openings required in their work for the subsequent move in of large units of mechanical work.

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8. Coordinate all items that will affect the installation of the work of this Division. This coordination shall include, but not be limited to, voltage, ampacity, capacity, electrical and piping connections, space requirements, sequence of construction, building requirements and special conditions.
9. When submitting Shop Drawings on the project, the Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

B. Coordination Drawings:

1. Coordinate the work of all Subcontractors for this Division with the Contractors responsible for this and other Divisions. Provide, in writing (with copies to the Engineer, Architect and Owner) all information necessary for coordination to permit the work of the project, including all Divisions, to be installed satisfactorily and with the least possible interference or delay.
2. The Division 23 Contractors, in coordination with Contractors responsible for other Divisions, shall prepare a complete set of construction "Coordination Drawings" that shall be completed and submitted to the Engineer, Architect and Owner within two (2) months after notice to proceed is given to the General Contractor. **If the General Contractor or any Subcontractor allows any work to be installed before coordinating with the work of other Subcontractors, the necessary changes for field coordination shall be made without extra cost to the Owner.**
3. "Coordination Drawings" shall be drawn at a scale of not less than 1/4" = 1'0". Drawings shall show actual equipment being provided and shall maintain all design drawing space allocations, designated dimensions, ceiling heights, chase dimensions, room sizes and service clearances recommended by the manufacturer of the equipment being provided. Deviations from ceiling heights, chase dimensions, room sizes and similar requirements on the Construction Documents shall not be made without specific prior written authorization from the Architect.
4. "Coordination Drawings" for interior construction shall show the coordinated locations for equipment, ductwork, piping, conduit, busway, devices, etc. and shall show all ductwork, all busway and all pipe and conduit larger than 4 inches using double lines. Elevations shall be shown for all construction and horizontal dimensions from major construction to accessible column or building lines shall be shown. Where required for coordination, offsets shall be shown and sections shall be cut and drawn.
5. "Coordination Drawings" shall indicate loads and anchor/support points for all piping 8 inches and larger, for all racked piping, for all racked conduit 3 inches and larger, for all busway and for all suspended equipment. These drawings shall be submitted to the Structural Engineer for review and approval. Any special hangers, embeds, supports, reinforcing, etc. required by the Structural Engineer shall be provided at no additional cost to the Owner.
6. "Coordination Drawings" for all work routed underground or embedded in concrete shall show specific dimensions to accessible column or building lines and the burial depth of all underground utilities. Where existing utilities are located in the area where new utilities are being installed, dimensions and burial depth for existing utilities shall be shown on "Coordination Drawings".
7. Each "Coordination Drawing" shall be completed and signed off by the General Contractor and all applicable Subcontractors prior to submission to the Architect, Engineer and Owner for submittal review, prior to installation of Division 23 or 26 work in the area covered by the specific coordination drawing.

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8. The requirement for "Coordination Drawings" shall not be construed as releasing the General Contractor or Subcontractors from their responsibility to coordinate the installation of the work or as authorization for the General Contractor or Subcontractors to make unauthorized changes to the Construction Documents or the project design concepts.

1.20 MATERIALS AND WORKMANSHIP:

- A. General: Materials and equipment shall be new, of best grade and quality, and standard products of reputable manufacturers regularly engaged in the production of such materials and equipment.
- B. Workmanship: Work shall be executed and materials installed in accordance with the best practice of the trades in a thorough, substantial, workmanlike manner by competent workmen, presenting a neat appearance when completed.
- C. Manufacturer's Recommendations: With exceptions as specified or indicated on the Drawings or in the Specifications, apply, install, connect, erect, use, clean, and condition manufactured articles, materials, and equipment per manufacturer's current printed recommendations. Copies of such printed recommendations shall be kept at the job site and made available as required.

1.21 SPACE REQUIREMENTS:

- A. General: Determine in advance of purchase that the equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearances for adjustments, repair, or replacement.
- B. Clearance: Allow adequate space for clearance in accordance with requirements of the Code and local inspection department.
- C. Scheduled Equipment: The design shown on the Drawings is based on the equipment scheduled.
- D. Responsibility: Since space requirements and equipment arrangement vary for each manufacturer, the responsibility for initial access and proper fit rests with the Contractor.
- E. Review: Final arrangements of equipment to be installed shall be subject to the Architect's review.

1.22 SAFETY REGULATIONS:

- A. All mechanical work shall be performed in compliance with all applicable and governing safety regulations. All safety lights, guards, signs, and other safety materials and provisions required for the performance of the mechanical work shall be provided by and operated by the Mechanical contractor.

1.23 DELIVERY, STORAGE AND HANDLING OF MATERIALS:

- A. General: Protect all materials and equipment to be installed under this Division from physical and weather damage.
- B. Scope: Work under this Division shall include, but not limited to:
 1. Shipping from point of manufacture to job site.
 2. Unloading, moving, and storage on site with proper protection as required.
 3. Hoisting and scaffolding of materials and equipment included in this Division.
 4. Ensuring safety of employees, materials, and equipment using such hoisting equipment and scaffolding.
- C. Installation Coordination: All large pieces of apparatus which are to be installed in the building and which are too large to permit access through doorways, corridors, stairways or shafts shall be

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brought to the job by the Contractor and shall be placed in the spaces before enclosing partitions and structure are completed.

- D. **Protection:** All equipment, materials and apparatus stored outdoors, in unenclosed spaces or in enclosed spaces at the jobsite or at the Subcontractor's facilities shall be protected against temperatures ranging from 20°F to 105°F, rain, wind, hail and all other weather conditions that are common to the site location.
1. **Storage Outdoors:** All equipment, materials and apparatus stored outdoors shall be cribbed up from the ground by Contractor and shall be covered with tarpaulins or other protective covering as required for protection. Provide temporary space conditioning inside protective enclosures as required to properly protect equipment, materials and apparatus.
 2. **Storage in an Unenclosed Building:** All equipment, materials and apparatus stored in an unenclosed building shall be cribbed up from the floor by Contractor and shall be covered with tarpaulins or other protective covering as required for protection. Provide temporary space conditioning inside protective enclosures as required to properly protect equipment, materials and apparatus.
 3. **Storage in and Enclosed Building:** All equipment, materials and apparatus stored in an enclosed building shall be cribbed up from the floor by Contractor and shall be covered with tarpaulins or other protective covering as required for protection. Provide temporary space conditioning as required to properly protect equipment, materials and apparatus which are stored in unconditioned buildings from damage.

1.24 NOISE AND VIBRATION:

- A. **General:** Warrant the heating, ventilating, air conditioning systems, and their component parts to operate without objectionable noise or vibration. Noise from systems or equipment which results in noise within occupied spaces above the recommended NC curves (refer to ASHRAE Standard) shall be considered objectionable. Vibration shall not be apparent to the senses in occupied areas of the building. Objectionable noise, vibration, or transmission thereof to the building shall be corrected.
- B. **Sound Testing:** Equipment shall be sound tested as specified in the individual Sections. The test data shall be expressed in sound power levels with decibels referenced to 10^{-12} watts and in octave bands as set forth in current ANSI Standards. The sound testing shall be performed in a reverberant room. The room effect shall be defined as the sound power level (decibels referenced to 10^{-12} watts) minus sound pressure level (decibels referenced to 0.0002 microbar) shall be established at 10 dB. The additive "allowance for multiple air outlets" for the purpose of the sound test shall be considered as 5 dB in determining the sound power level per air terminal. The final sound pressure level test results shall be based on the above requirements unless noted or specified otherwise and shall not exceed the noise criteria curve limitations specified.
- C. **Noise Level:** Except in special areas listed separately, the noise level in occupied spaces shall be equal to, or less than, the "lowest value in the range" of the noise criteria curves for the particular space in accordance with Chapter 7, Table 11 of the 2009 Fundamentals Edition of the ASHRAE Handbook. The noise criteria curves shall be based on current ANSI Standard octave bands and a sound pressure level in decibels referenced to 0.0002 microbars. Sound levels within the occupied spaces must meet the criteria described above and with all building, wall partition, floor, and ceiling construction in place as they exist for the individual spaces. The attenuation through boundary construction of equipment rooms must be considered in selecting equipment for acceptable noise level.

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- D. Verification: Should a question arise of whether noise and vibration in a particular space or piece of equipment meet the above criteria, the Contractor shall be responsible for providing the services of an approved vibration or acoustic consultant to verify criteria compliance.

1.25 ADJUSTING AND START-UP:

- A. Start-up Services: Where specified for any individual item of heating, ventilating, air conditioning, and plumbing equipment, provide a factory-authorized representative for testing, start-up of equipment, and instruction of Owner's operating personnel. Certify that these services have been performed by including a properly executed invoice for these services or a letter from the manufacturer.
- B. Lubrication: Provide a readily accessible means for lubricating all bearings and other machine parts. Extend a lubrication tube with suitable fitting to an accessible location and suitably identify it where lubrication fittings are concealed or inaccessible. Lubricate all parts requiring lubrication and keep them adequately lubricated until final acceptance by the Owner.
- C. Air Filters: Air filters shall be installed on all equipment so equipped prior to initial start-up. In addition, blanket filters shall be installed over coils, filters and over fan powered terminal unit inlets as a pre-filter during construction. Final filters shall be installed prior to the owner's beneficial use (substantial completion)
- D. Testing, Adjusting and Balancing: Refer to Section 23 0593 for requirements.
- E. Operation Prior to Completion: When any piece of mechanical equipment is operable and it is to the advantage of the Contractor to operate the equipment, he may do so, providing that he properly supervises the operation, and has the Engineer's written permission to do so. The warranty period shall, however, not commence until such time as the equipment is operated for the beneficial use of the Owner, or the date of substantial completion, whichever occurs first. Regardless of whether or not the equipment has or has not been operated the Contractor shall properly clean the equipment, install clean filter media, properly adjust and complete all deficiency list items before final acceptance by the Owner. The date of final acceptance and the start of the warranty may not be the same date.

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1.26 SITE CLEAN-UP:

- A. Daily Clean-Up: Each Contractor shall clean away from the job site all debris, surplus material, and similar items, resulting from his work or operations, on a daily basis leaving the job and equipment in a clean condition. Each Contractor shall thoroughly clean all pieces of equipment, fixtures, and similar items, leaving the installation in a first class, clean, operable condition.
- B. Clean Work Space: **If the facility will remain occupied during the construction process, each Contractor shall clean up and maintain, at all times, areas visible to the public to prevent the appearance of a sloppy or careless work space. Employee trash shall be disposed of in a designated trash receptacle maintained by the Contractor. All demolition or construction debris not designated for salvage by the Owner shall daily be collected and temporarily held in an area designated by, and in quantities allowed by, the Owner or the Contractor, or shall be removed from the site by the Division 23 Contractor and disposed of properly off site.**
- C. Salvageable Materials: **Materials designated by the Owner to be salvaged shall be stored in the building, at a location as directed by the Owner. The Contractor shall verify with the Owner which materials are to be salvaged.**

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- D. **Continuing Facilities Maintenance:** In areas that contain equipment or systems that must be serviced, inspected, or maintained, no construction debris shall be allowed to block normal access paths or inhibit the required maintenance or service of those systems. The Contractor shall immediately remove any debris that constitutes a hindrance to normal service.
- E. **Directed Clean-Up:** If the facility will remain occupied during the construction process, and should, for any reason, the Owner, the Architect or the Engineer notify the Contractor of his failure to comply with a clean work space requirement, and the Contractor ignores this requirement, the Owner may retain the services of a clean-up crew to maintain a clean public work space and back charge the Contractor for such contract costs.

1.27 POLICIES AND PROCEDURES

- A. **Employees:** Employees of the Contractor that are assigned to this project shall be competent, experienced personnel who have received training for their related tasks and in the operation of any equipment that they are to operate.
- B. **Identification:** Employees shall be uniformed or wear clothing that clearly distinguishes them as employees of the contractor or subcontractors authorized to provide services at this facility. In addition, employees shall have picture identification badges of a type acceptable to the Owner.
- C. **Supervision:** Each work crew on the project shall include a full-time site foreman or supervisor.
- D. **Contact:** The contractor shall provide a contact point, available by phone or pager, who will respond immediately to problems, questions or concerns reported by the Owner.
- E. **Training:** Employees shall be trained in any required safety precautions related to the equipment and materials that they are using.

1.28 FINAL REVIEW:

- A. **General:** Upon completion of the Work, perform a final test of the entire system.
 - 1. The system shall be operating properly with all water and air volumes balanced and all temperature controls adjusted.
 - 2. After the final test, any changes or corrections noted as necessary for the Work to comply with these Specifications or the Drawings shall be accomplished without delay in order to secure final acceptance of the Work.
 - 3. The date for the final test shall be sufficiently in advance of the Contract completion date to permit execution, before expiration of the Contract, of any adjustments or alterations which the final acceptance tests indicate as necessary for the proper functioning of all equipment. Any such modifications shall be completed within the time allotted for completion of the Contract. Retests shall be conducted as directed and shall be of such time duration as necessary to ensure proper functioning of adjusted and altered items. Retests shall not relieve the Contractor of completion date responsibility.
 - 4. Certificates, including certificates of occupancy from local authorities and documents required herein, shall be completely in order and presented to the Engineer at least one week prior to the review.
- B. **Qualified Person:** Individuals knowledgeable of the systems and persons approved by the Engineer, shall be present at this final inspection to demonstrate the system and prove the performance of the equipment.

1.29 OWNER INSTRUCTION:

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- A. General: This Contractor and appropriate factory-trained representatives shall provide to the Owner's representative the specified or manufacturer recommended training and instruction in the proper operation and maintenance of all systems and equipment and shall explain all warranties.
- B. Outline: Prior to instruction of Owner Personnel, prepare a typed outline, listing the subjects that will be included in this instruction, and submit the outline for review by the Engineer and Owner.
- C. Certification: At the conclusion of the instruction period obtain the signature of each person being instructed on each copy of the approved outline to signify that he has a proper understanding of the operation and maintenance of the systems and resubmit the signed outlines.
- D. Other Requirements: Refer to other Division 23 Sections for additional operator training requirements.

1.30 CONTRACTOR WARRANTIES AND GUARANTEES:

- A. General: Contractor shall guarantee all material and equipment installed against defects in workmanship and material for a period of 12 months after final acceptance of the Work by the Owner. Contractor shall repair or replace any materials or equipment developing such defects within that time, promptly on due notice given by the Owner and at Contractor's sole cost and expense.
- B. Equipment: All equipment bearing a manufacturer's guarantee, such as motors, compressors, condensers, heat exchangers, water heaters, blowers, controls, and similar items, shall be construed to have an extended guarantee to the Owner by the manufacturer. Any such equipment that proves defective in materials or workmanship within the guarantee period is to be replaced by the Contractor in accordance with the manufacturer's guarantee.
- C. Start-up: The Division 23 Contractor shall provide instructions and equipment starting service on new equipment for 12 months after date of final acceptance of the work by the Owner, at Contractor's sole cost and expense.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 23 0100