

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

- A. General provision:
1. Mechanical General Provisions supplement the requirements of Division 1 - General Requirements.
 2. This Division is an integrated whole comprising interrelated and interdependent sections and shall be considered in its entirety in determining requirements.
 3. Applies to all Work and requirements of Division 15.
- B. Provide a complete and operable installation, including all labor, supervision, materials, equipment, tools, apparatus, transportation, warehousing, rigging, scaffolding and other equipment and services necessary to accomplish the work in accordance with the intent and meaning of these drawings and specifications.
- C. Related work specified elsewhere:
1. Concrete work, except as otherwise specified: Division 3 - Concrete.
 2. Motor starters and disconnect switches, wiring and conduit, except as otherwise specified: Division 16 - Electrical.
 3. Painting, except as otherwise specified: Division 9.
 4. Outside air intake, exhaust louvers and screens: Division 10.
 5. Installation of access doors and plaster frames for registers and grilles: Division 9.
- D. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1.
1. Submittals
 2. Coordination drawings
 3. Record Documents
 4. Maintenance manuals
 5. Rough-ins
 6. Mechanical installations
 7. Cutting and Patching

1.2 DEFINITIONS (AS USED ON DIVISION 15 DRAWINGS AND HEREIN)

- A. "Provide" means furnish, install and connect unless otherwise described in specific instances.
- B. "Piping" means pipes, fittings, valves and all like pipe accessories connected thereto.
- C. "Ductwork" means ducts, plenums, compartments, or casings including the building structure, which are used to convey or contain air.
- D. "Extend", "Submit", "Repair" and similar words mean that the Contractor (or his designated subcontractor) shall accomplish the action described.

- E. "Codes" or "Code" means all codes, laws, statutes, rules, regulations, ordinances, orders, decrees, and other requirements of all legally constituted authorities and public utility franchise holders having jurisdiction.
- F. "Products", "Materials" and "Equipment" are used interchangeably and mean materials, fixtures, equipment, accessories, etc.
- G. "Utility Areas" are defined as mechanical, electrical, janitorial, and similar rooms or spaces which are normally used or occupied only by custodial or maintenance personnel. "Public Areas" are defined as the rooms or spaces that are not included in the utility areas definition.
- H. "Building Boundary" includes concrete walkways immediately adjacent to the building structure.
- I. "Below Grade" means buried in the ground.
- J. "Substantial Mechanical Completion" means all components of all systems are functioning but lacking in final adjustment.
- K. "Pressure Rating Specified" (such as for valves and the like) mean design working pressure for and with references to the fluid which the device will serve.

1.3 QUALITY ASSURANCE

A. Regulations and standards: (Current Edition unless otherwise noted)

AABC	Associated Air Balance Council
ADC	Air Diffuser Council, Test Code
AGA	American Gas Association
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CCR	California Code of Regulation
CBC	California Building Code
CEC	California Electric Code
CMC	California Mechanical Code
CPC	California Plumbing Code
CTI	Cooling Tower Institute
CS	Commercial Standards - U.S. Department of Commerce
CISPI	Cast Iron Soil Pipe Institute
FMS	Factory Mutual System
FIA	Factory Insurance Association
HI	Hydraulic Institute Standards
IAPMO	International Association of Plumbing and Mechanical Officials
IRI	Industrial Risk Insurance Companies
ISA	Instrument Society of America
MSS	Manufacturers Standardization Society
NCWB	National Certified Pipe Welding Bureau
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NEBB	National Environmental Balancing Bureau
OSHA	Occupation Safety and Health Act
PDI	Plumbing and Drainage Institute
SAMA	Scientific Apparatus Makers Association

SHEMA Steam Heating, Equipment Manufacturers Association
SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.
SCAQMD Southern California Air Quality Management Division
UL Underwriters Laboratories, Inc.

- B. Requirements of regulatory agencies: Nothing in the Drawings and Specifications shall be construed to permit work not conforming to applicable laws, ordinances, rules and regulations. In the event of a conflict with local ordinances and statutes, the local requirements shall take precedence over the specified standards and codes. When drawings and specifications exceed requirements of applicable laws, ordinances, rules and regulations, the Drawings and Specifications take precedence. It shall be the Contractor's responsibility to correct, at no cost to the Owner, any work he executes in violation of Code requirements. Specific references to codes elsewhere in this Division are either to aid the Contractor in locating applicable information or to deny him permission to use options that are permitted by codes.
- C. Permits and inspections charges:
 - 1. Refer to the General Conditions of the Contract.
 - 2. Obtain schedule and pay for permits, licenses, approvals, tests, inspection and certificate of final inspection required by legally constituted authorities and public utility franchise holders having jurisdiction over the work.
 - 3. Afford the owner's representative every facility for evaluating the skill and competence of the mechanics and to examine the materials. Concealed work shall be reopened when so directed during the periodic visits.
- D. Service connections:
 - 1. Sanitary and storm sewer: Make all arrangements with the proper authorities, pay all required charges and connect building sewers to existing street sewers where indicated.
 - 2. Domestic "plumbing" water: Make all arrangements with the proper authorities and pay all required charges for water meter installation and connect to main where indicated.
 - 3. Fire main: Make all arrangements with the proper authorities; pay all required charges for the fire and domestic water service mains. Extend the mains through the building to the fire pump and to the domestic service as indicated. Provide outside indicating valve in concrete manhole. Connections to street water mains shall be included in the work of this section.

1.4 PROJECT CONDITIONS

- A. Verifying Job Conditions: Examine all drawings and specifications in a manner to be fully cognizant to all work required under this Division. Adjoining work of other trades shall be examined for interferences and conditions affecting the work of this Division.
- B. Visit site prior to bidding and investigate the existing conditions that affects and will be affected by the work of this Division. Become familiar with the working conditions and take into account any special or unusual features peculiar to these jobs. By the act of submitting the bid, the contractor will be deemed to have complied with the foregoing, to have accepted such conditions, and to have made allowance therefore in preparing his bid.
- C. The locations of existing utility lines are shown in accordance with reference data received by the Architect. The points of connection are therefore approximate and the Bidder shall include in his bid adequate funds to cover cost of connection regardless of their exact location.
- D. Exercise extreme caution during trenching operations. Repair the damage caused by such operations to existing utility lines at no cost to the Owner, whether the lines are shown on the drawings or not.

1.5 DRAWINGS

- A. The Contract Drawings indicate the general arrangement of piping, ductwork and equipment.
1. For the purpose of clarity and legibility, drawings are essentially diagrammatic to the extent that many offsets, bends and special fittings and exact locations of items are not specifically dimensioned. Diagrammatic drawings shall be understood as schemes of required systems.
 2. Drawings and specifications are intended to complement each other. Where conflicts exist between the drawings and/or specifications, request clarification.
 3. "The Architect" and/or, "The Engineer" shall interpret the drawings and the specifications, as to the true intent and meaning thereof and the quality, quantity, and sufficiency of the materials and workmanship furnished there under.
 4. In case of conflicts not clarified prior to bidding deadline, use the better quality, greater quantity or larger size in preparing bids. After the contract is awarded should the conflict require changes to the scope of work, a credit for the greater quantity will be required.
 5. Certain runs of piping or ductwork may be shown distorted to avoid confusion. However, systems shall be grouped into orderly function and relationship, consistent with code requirements and working space.
 6. Exact routing of systems, grilles, and devices shall be governed by structural conditions and obstructions.
 7. Building and room dimensions, location of doors, partitions and similar physical features shall be taken from the Architectural Drawings at the approximate location shown on the Mechanical Drawings.
 8. Manufacturers' drawings and instructions shall be followed in all cases and will become the basis for inspecting and accepting or rejecting actual installation procedures utilized in the performance of the work. Where manufacturer's instructions are in conflict with local codes or governing ordinances, the architect shall be notified for determination.
 9. It is the responsibility of the Contractor to install the work in such a manner that it will conform to the structure, avoid obstructions, and maintain headroom.
 10. Above items to be performed at no additional cost to the Owner.
 11. Manufacturer's drawings and instructions, when not in conflict with governing codes, shall be followed in all cases where the makers of devices and equipment furnish directions or details not shown on the Drawings or described in the Specifications.
 12. Drawings are not intended to be scaled, but shall be followed with sufficient accuracy to coordinate with other work and structural limitations.
 13. Work installed in a manner contrary to that shown on the drawings shall be removed and reinstated when so directed by the Architect. Discrepancies and questionable points shall be immediately reported to the Architect for clarification.
- B. Modification of Contract Drawings:
1. In the event that substitute materials or equipment will require, for proper installation, changes to the design as indicated on the Contract Drawings, appropriate proposed revision drawings in an approved format shall be submitted for review. Such drawings shall be sufficiently complete for the proper installation of the proposed substitute materials or equipment and for construction by all interested trades of the proposed revisions to the Contract Documents.

2. The cost of the drawings, cost of drawing checking, and approval by all legally constituted authorities having jurisdiction shall be borne by the Contractor. All such drawings shall be made a part of the record documents as specified in Division 1.
- C. All provisions shall be deemed mandatory except as expressly indicated as optional by the work "may" or "option".
- D. Contractor shall verify, at the site, the location of all existing equipment, ductwork, piping, utilities, panel boards and partitions affecting the installation of new work.

1.6 INSTALLATION OF THE WORK

- A. Installation of mechanical work shall be coordinated with the Project Construction Schedule. The contractor shall be totally responsible for coordinating the layout of all building elements to avoid conflict of the work of the structural, mechanical, electrical systems, and architectural features of the building. The cost of any extra work of any kind caused by a conflict due to this lack of coordination shall be borne by the Contractor.
 1. Before proceeding with the work, the Contractor shall examine all Contract Documents, check and verify all dimensions and sizes that may affect the fitting of his materials and equipment to other parts of the equipment, structure and work of other Divisions.
 2. Work installed, which interferes with the work of other trades, shall be removed and reinstalled at the Contractor's expense when so directed by the Architect.
 3. It shall be understood that no extras to the Contract will be permitted to accomplish the above results.
 4. Notify the Architect of points of conflict between the work and that of other trades so that the conflict may be properly adjusted.
 5. Coordinate mechanical systems, equipment, and materials installation with other building components.
 6. Verify all dimensions by field measurements.
 7. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 8. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 9. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 10. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 11. Coordinate connection of mechanical system with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 12. Install systems, materials, and equipment to conform to approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 13. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

14. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components, where installed exposed in finished spaces.
 15. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specific slope.
- B. Coordinate field details with other trades to avoid construction delays and maintain required clearances.
1. Equipment bases and supports: Furnish certified details and drawings for approval before fabrication. Furnish all parts necessary for each base, sub-base and support.
 2. Pipe sleeves and inserts: Furnish and install all pipe sleeves and pipe support inserts before concrete is poured.
 3. Roof, wall and floor openings: Furnish shop drawings showing exact locations and sizes of openings through roofs, walls and floors.
 4. When changes in size of equipment bases and pads result in additional design and construction costs, such costs shall be borne by Contractor.
 5. Moving of equipment: Investigate each space through which equipment must be moved. Where necessary, equipment shall be shipped from manufacturer in crated sections of size suitable for moving through restricted spaces available.
- C. Examine other Divisions for work related to the work of this Division, especially Division 16 Electrical.
- D. Rough-In
1. Verify final locations of rough-ins with field measurements and with the requirements of the actual equipment to be connected.
 2. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.
- E. Delivery and Storage:
1. All material shall be delivered to the site with all labels intact and identified to permit check against approved material lists and for shop drawings. Lost or damaged materials and equipment will be replaced by new at no increase in contract cost. Damaged factory applied finishes supplied with final finish under this division shall be refinished as approved by the Architect, employing workmen skilled in the work involved. Finishing materials shall be obtained from the equipment or materials manufacturer.
 2. Protect materials against dirt, water, chemical and mechanical damage both while storage and during construction.
- F. Substitution of materials and equipment:
1. Where no specific make of material or equipment is mentioned, appropriate products of approved manufacturers may be used, providing they conform to the requirements of the system.
 2. Materials and equipment may be followed by phrases "similar to", "equal to", or "as approved". In the cases, if the Contractor desires to use any other brand or manufacturer of the same quality, appearance and utility to that specified he shall request substitution as approved below, within thirty (30) calendar days after the commencement of the work. The Architect will approve or disapprove the request for substitution and his decision shall be final. Unless substitutions are requested within the time stated above, and as provided below, no deviation from the Specifications will be allowed. Requests for substitutions will only be considered if the Contractor submits the following information items 3 through 7.

3. Complete technical data including drawings, performance specifications, cost data and tests of the article proposed for substitution, including the reason for substitution.
4. Complete breakdown of costs, indicating the cost differential to the Contract if the proposed substitution is accepted.
5. Statement by the Contractor that the proposed substitution is in full compliance with the Contract Documents and applicable codes.
6. List of other trades, which may be affected by the substitution.
7. The Contractor shall be responsible for any effect upon related work of any substitution and shall bear any additional costs generated by any substitutions, including the costs of the Architect/Engineers' additional services thereby made necessary.

1.7 OPENINGS, CUTTING AND PATCHING

- A. Openings have been indicated on the Architectural and Structural Drawings, additional openings or holes required for the work of this Division and cost of such work is an obligation to this Division.
 1. Openings, cutting and patching to be in accordance with that specified under Division 1.
 2. At a time in advance of the work, verify the openings indicated on Architectural and Structural Drawings. If the work of this Division requires such, furnish new instructions as to requirements for these openings, subject to approval by the Architect.
- B. Additional cutting and patching and reinforcement of construction of building, required under the work of this Division, subject to approval by the Architect, to be performed under the Division of the Specification covering the particular materials, and the cost of same shall be an obligation to this Division.
- C. Core drilling of floor slabs and concrete walls for passage of pipes, where authorized by the Architect, shall be provided under the work of this Division.

1.8 CORROSION PROTECTION

- A. All below ground metallic fittings, valves, flanges, bolts, shall be protected against corrosion as follows:
 1. All metallic components as described above shall receive a heavy coating of "Henry's" or "Marvin" oil base roof mastic.
 2. After mastic coating is completed and inspected, wrap entire metallic component with a minimum of 8 mil polyethylene wrap overlapped 50% of the circumference and extended beyond ends of component as required for polyethylene to be secured to piping. The overlap seam shall be located to avoid backfill material from entering the encapsulated area. The ends of the seam of the polyethylene material shall be secured to the piping and sealed with 3M Scotch or Calpico/Wrap No. 50, 10 mil, 2 inch wide, printed, pipe wrap and sealing tape.
 3. The mastic coating shall be inspected and approved prior to finish application of the polyethylene material, which shall also be inspected.

1.9 PROJECT RECORD DOCUMENTS

- A. Drawings of Record: The Contractor shall provide and keep up-to-date a complete record set of blue line prints. These shall be from the original drawings. Prints for this purpose may be obtained from the Architect at cost. This set of prints shall be kept on the job site, and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case.

- B. The actual size, location and elevation of all buried lines, valve boxes, manholes, monuments, and stub outs shall be accurately located and dimensioned from building walls or other permanent landmarks.
- C. Changes: Clearly and correctly mark Record Drawings to show all changes made during the construction process at the time the changed work is installed. No such changes shall be made in the work unless authorized by a Modification or by a specific approval of deviations or revisions in submittals.
- D. Upon completion of the work, a set of reproducible drawings marked as "As-Builts" and a compact disk containing electronic files of the drawings in current version of AutoCAD shall be submitted to the Architect for approval. After approval, asp-built drawings and the electronic file shall be turned over to the Owner's Representative.

1.10 STANDARDS

- A. Compliance shall be in conformance with the requirements of Division 1. Submit proof of material and equipment conformance to the requirements of Regulations and Standards. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, the Contractor may submit a written certificate from an approved, nationally recognized testing organization, adequately equipped and competent to perform such services, verifying that the items have been tested and that the work conforms to the Regulations and Standards, including the methods of testing utilized by the testing agency.

1.11 MATERIALS AND EQUIPMENT

- A. Compliance shall be in conformance with the requirements of Division 1.
 - 1. Provide products by manufacturers regularly engaged in the manufacture of similar items with an acceptable history of successful production and ability to render competent and thorough technical services and spare parts through local organizations.
 - a. Provide the names and addresses of the nearest service and maintenance organization and spare parts supplier.
 - b. Discontinued models will not be accepted by the owner even if that model was specified. The architect must be immediately notified if there is a conflict in this matter.
 - 2. Materials and equipment shall be new, current models of manufacturers and bear complete identification by the manufacturers.
 - 3. Materials and equipment shall be guaranteed by the manufacturer to equal or exceed specified, submitted and published ratings. Equipment specified by manufacturer's number shall include all accessories, controls and devices listed in manufacturers catalog as standard with the equipment.
 - 4. Provide a complete working installation with all equipment called for in proper operating conditions. Drawings and Specifications do not undertake to list every item or device of equipment to be installed. When an item or device is necessary for the operation of the equipment shown or specified, the items or devices shall be provided with the equipment that will allow the system to function properly.

1.12 SHOP DRAWINGS, MATERIAL LISTS AND SUBMITTAL DATA

- A. Comply with requirements of Division 1 - "Submittals" and the following:
 - 1. Material list: 6 copies of a complete list of material and equipment tabbed and according to main areas of work, shall be submitted to the Architect within 30 days after award of Contract. Submission shall include manufacturers' names, catalog numbers and other data necessary for identification. 3 copies will be returned to the Contractor. If corrections are required, 6 additional copies shall be resubmitted within 15 days. No material or equipment is to be delivered to the job site until the Architect has reviewed material lists. Contractor shall note all items that replaced discontinued models or items.

2. Submittal data: Printed catalog material and brochures covering equipment and material shall be submitted as follows: 2 copies shall be submitted for preliminary review; 1 copy shall be returned to the Contractor, who shall review the corrections, if so noted, and resubmit 6 copies for final review. Assemble each brochure with tabbed separators for each specification section where products are noted to be submitted, with separate tabs for each product label.
 3. Three copies of final submittal data will be returned to the Contractor. The Contractor may submit additional copies deemed necessary to correlate the work of other trades.
 - a. Submittal data to include complete brochures containing only items specified, indicating names of manufacturers, catalog figure numbers, technical data and requested information on each item.
 - b. Submittal data to be referenced to section number and paragraph numbers of the specifications, and to fixture and equipment indicated. Brochure not to contain extraneous material not specified.
- B. Shop Drawings:
1. Submission of shop drawings shall consist of 6 complete sets, one of blue line prints and the other of sepia transparency, indicating the required technical information. One complete set of the sepia transparency will be returned to the Contractor.
 2. Shop drawings shall use the same nomenclature indicated on the Drawings and must indicate locations where material or equipment is to be installed.
 3. Shop drawings shall be submitted covering equipment, piping and ductwork in each equipment room.
 4. Shop drawings shall be coordinated with all other trades covered by Contract Drawings before submission to the Architect.
 5. Submit following material with all equipment room shop drawings:
 - a. Manufacturer's specifications, including materials, type, performance characteristics and capacity ratings.
 - b. Certified dimension drawings, indicating size, component parts and installation details.
 - c. Electrical wiring diagram and controls where applicable.
 - d. Complete automatic control and wiring diagrams.
 - e. Equipment supports.
 - f. For items such as valves, hangers and accessories, indicate specific items and where they are to be used.
 - g. Supplementary framing including calculations.
 6. Equipment and/or materials installed without the Contractor receiving written approval from the Architect are subject to removal and replacement by the Contractor with approved materials, at no additional cost to the Owner, or delay of job progress.

- C. Submittals: Unless otherwise specified, specific items for which the following requirements apply and for which submittals are required shall be as specified in each section of Division 15.
1. **Manufacturer's Data:** Submittals for manufactured items shall comprise manufacturer's descriptive literature, drawings, diagrams, performance and characteristic curves, and catalog cuts. These shall be identified by manufacturer's name, trade name, model or catalog number, name-plate data, size, layout dimensions, capacity, project specification reference, applicable Federal, Military, industry, and technical society publication references, and any other additional information necessary to establish contract compliance. Photographs of existing installation and similar data submitted in lieu of manufacturer's catalog data are not acceptable and will be returned without approval.
 2. **Shop Drawings:** Submit required shop drawings in one complete package. Drawings shall be drawn to a minimum scale of 1/8 inch; shall be a minimum of 14 x 20 in size; and shall include wiring diagrams, plans, elevations, and sections of equipment and control spaces identifying and indicating proposed and existing locations, layouts, and arrangement of items of equipment, control panels, accessories, piping, ductwork, and any other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Indicate adequate clearances for operation, maintenance, and replacement of operating equipment and devices. If any equipment is disapproved, revise drawings to show acceptable equipment resubmitted.
 3. **Standard Compliance:** Where equipment or materials are specified to conform with requirements of standards of recognized technical or industrial organizations such as National Electrical Manufacturers Association, American Society for Mechanical Engineers (ASME), Underwriters' Laboratories (UL), American Gas Association (AGA), or American Refrigeration Institute (ARI), that use a label or published listing as a method of indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, submit a certificate from an independent testing organization of suitable competence, stating that the item has been tested and found to conform to the specified standard.
 4. **Certificates of Conformance of Compliance:** Certifications shall be in the original and not preprinted. The certification shall not contain statements that could be interpreted to imply that the project does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified.
 5. **Certified Test Reports:** Certified Test Reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use. Before delivery of materials and equipment proposed for use, results of the tests shall be submitted in accordance with the requirements for laboratory test results of this Contract.
 6. **Factory Tests:** Factory tests are tests that are required to be performed on the actual materials or equipment proposed for use. Submit results of the tests in accordance with the requirements for laboratory test results of this Contract.
 7. **Permits and Certificates of Inspection:** Furnish the originals.
 8. **Testing procedures and test results required in this and other sections.**
 9. **Other data required by other sections of this Division.**
- D. Submit for review only the specific items required in this section or other sections of Division 15.
- E. Submittal materials will be reviewed for substantial conformity with the intent of the contract plans and specifications only. Such review does not indicate approval of dimensions, quantities, coordination with other trades, or work methods of the contractor, which are indicated thereon.

F. Additional copies may be required by individual sections of these specifications.

1.13 CLOSING-IN OF UN-INSPECTED WORK

A. Contractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested and approved by the Architect and proper inspector. Should any of his work be covered up or enclosed before such inspection and test, he shall, at his own expense, uncover the work and after it has been inspected, tested and approved, make all repairs with such materials as may be necessary to restore all his work and that of other trades to its original and proper condition.

1.14 EQUIPMENT SUPPORTS

A. Furnish and install necessary steel supports and seismic restraints for fans, coils, receivers, tanks, piping and other equipment for a complete installation and as approved by the Architect. Supports shall be painted with one coat of rust-preventative paint after installation under work of this Division.

1.15 BUILDING FOOTING CLEARANCES

A. Under no circumstances shall pipes, ducts or conduits be run through footings. They shall cross below footings or through sleeves above footings. Those running parallel to footings shall have the minimum clearances from the cone of influence indicated on the Structural Drawings or as required by Code.

1.16 DAMAGE BY LEAKS

A. Contractor shall be responsible for all damage to any part of the premises caused by rain leaks through or around ducts or pipes, leaks or breaks in piping, equipment or fixtures furnished and/or installed by him for a period of 1 year from the date of acceptance of the work by the Owner.

1.17 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

A. All motors, power driven equipment and automatic control equipment, except motor starters as hereinafter set forth required and connected with the work of this section of the specifications are to be furnished and installed under Division 15.

B. Control low (24V) and control line (120V) voltage wiring, conduit and related switches and relays required for the automatic control and/or interlock of motors and equipment including final connection, are to be furnished and installed under Division 15. Materials and installation to conform to Class 1 or 2, CCR Title 24, Article E725, and as restricted under the Division 16 Electrical of these specifications.

C. Power wiring, conduit, outlets, disconnect switches motor starter and motor-rated contactors, and making of final connections, except as hereinafter specified, are to be furnished and installed under the Division 16 Electrical of the specification.

D. Identify circuits and equipment as outlined in the Electrical section of these specifications.

E. Coordinate requirements for underground conduit only between buildings for control interlocks shown on the drawings. This conduit to be furnished and installed under Division 16 of these specifications.

1.18 SUPPLEMENTARY FRAMING

A. Provide supplementary framing required for attachment of hanger, supports and anchors. Fasten supplementary framing to structure in an approved manner. Supplementary framing of structural angle iron, channels and "I" beams properly designed to carry the weight of piping and its contents and to withstand any thrust exerted by the expansion or contraction of the piping.

- B. Submit details of hangers, anchors, supplementary framing including the proposed method of fastening of supplementary framing to the base building structure and calculations used in determining the proposed fastening method.
- C. Structural work shall conform to applicable building codes.
- D. Paint supplementary framing with one coat of rust preventive paint after installation of work under this Division.

1.19 STARTERS, DISCONNECTS AND WIRING

- A. Starters and disconnects will be provided under Division 16 Electrical, except for special equipment which is specified with the equipment.
- B. All line voltage control wiring and all conduits for both line voltage and low voltage control wiring shall be provided under Division 16 Electrical, except as specified under Division 15 and/or specified herein.

1.20 ADDITIONAL BALANCING DEVICES

- A. Provide any additional apparatus, devices or equipment that may be required to completely balance all the air and hydronic systems. Such apparatus, devices or equipment shall be included in the work at no additional cost to the Owner.

1.21 DELIVERY, HANDLING, STORAGE OF MATERIALS, PROTECTION OF WORK

- A. Properly store, adequately protect, and carefully handle equipment and materials to prevent damage before and during installation as recommended by the manufacturer and as approved by the Architect. Items determined to be damaged or defective shall be replaced at no cost to the Owner. Determinations of the Architect shall be final.
- B. Protect materials against dirt, water, chemical and mechanical damage both while in storage and during construction.
- C. Cover materials in such a manner that no finished surfaces will be damaged, marred or splattered with plaster or paint, and all moving parts will be kept clean and dry.
- D. Replace or refinish any damaged materials including fronts of control panels, ductwork fittings, and shop-fabricated ductwork.
- E. Keep cabinets and other openings closed to prevent entry of foreign matter.
- F. Refer to other sections of this Division for additional requirements.

1.22 STANDARD PRODUCTS

- A. Materials and equipment shall be essentially the standard catalogued products of manufacturers regularly engaged in production of such materials or equipment, and shall be their latest standard designs that comply with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer. The components thereof, however, are not required to be exclusively of the same manufacturer. Each major component of equipment shall have manufacturer's name, address, model and serial number on a nameplate securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

1.23 SAFETY REQUIREMENTS

- A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type specified herein. Provide items such as catwalks, ladders, and guard rails where required for safe operation and maintenance of equipment.

1.24 MANUFACTURER'S RECOMMENDATIONS

- A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material or equipment being installed, furnish printed copies of these recommendations to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.25 OPERATION AND MAINTENANCE MANUAL:

- A. Furnish an operation and maintenance manual covering the stipulated mechanical systems and equipment. Seven copies of the manual, bound in the hardback binders or an approved equivalent, shall be provided to the Owner and one copy to the Architect. Furnish one complete manual prior to the time that system or equipment tests are performed. Furnish the remaining manuals before the contract is completed. The following identification shall be inscribed on the cover:

1. Operations and Maintenance Manual
2. Building Number
3. Contractor
4. Contract Number

- B. Provide a table of contents. Insert tab sheets to identify discrete subjects. Instruction sheets shall be legible and easily understood, with large sheets of drawings folded in. The manual shall be complete in all respects for all equipment, controls, accessories and appurtenances stipulated. Include as a minimum the following:

1. System layout showing piping, valves and controls.
2. Wiring and control diagrams with data to explain detailed operation and control of each component.
3. A control sequence describing start-up, operation and shutdown.
4. Detailed description of the function of each principal component of the system.
5. Procedure for starting.
6. Procedure for operating.
7. Shutdown instructions.
8. Installation instructions.
9. Adjustments, maintenance and overhaul instructions.
10. Lubrication schedule including type grade, temperature range and frequency.
11. Safety precautions, diagrams and illustration.
12. Test procedures.
13. Performance data.

14. Parts lists, with manufacturer's names and catalog numbers.
 15. Preventive maintenance schedule.
 16. Service organization with name, address and telephone number.
 17. Valve identification chart and schedule.
 18. ASME certificates.
 19. Air balance report.
- C. Provide operation and maintenance manuals for all mechanical and electrical equipment.

1.26 INSTRUCTIONS TO OWNER PERSONNEL

- A. When specified in other sections or herein, the Contractor shall furnish, without additional expense to the Owner, the services of competent instructors who will give full instruction to the designated personnel in the adjustments, operation, and maintenance, including pertinent safety requirements, of the equipment or system specified. Each instructor shall be thoroughly familiar with all parts of the installation, and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of man-days of instruction is specified; approximately half of the time shall be for classroom instruction. All other time shall be used for instruction with the equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.
- B. The following systems and equipment shall be required to be furnished with operating instructions videocassette:
1. Miscellaneous fan equipment and systems, man-day (3 hours per system).

1.27 SPARE PARTS AND TOOLS

- A. Contractor shall furnish difficult-to-obtain manufacturer unique spare parts upon contract completion.
- B. Contractor shall furnish any special tools required to service equipment with the equipment. Provide a lockable metal toolbox to secure tools.

1.28 WARRANTY

- A. In addition to requirements of the Conditions of the Contract, warrant all equipment, ratings, capacities, motor HP, etc., to produce the specified and indicated performance at an elevation of the project site above sea level.
1. Refer to Division 1 for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
 2. Contractor shall guarantee all workmanship, equipment and materials installed under his contract for a period of not less than one year from the date of acceptance of the installation. Should any defects occur during this period, the Contractor shall promptly repair or replace the defective item and any other damage caused to the building free of charge to the Owner, including cost of labor and materials.
 3. Where periods more than one year are specified in the specifications, such longer periods shall govern. However, when any component fails at any time during this period, the warranty period for such component and all other components which are inactive because of said failure shall be suspended. The warranty period for such components shall resume running for the remaining portion of this warranty period when failed components are completely repaired and in operation; however, in no case shall the resumed portion of the warranty period be less than 3 months in duration.

4. Neither payment for work, nor total or partial occupancy of work by the Owner, within or prior to the warranty period specified, shall be construed as acceptance of faulty work or shall condone any negligence or omission of Contractor in doing the work.
5. Compile and assemble the warranties specified in Division 15, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
6. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names and addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.
7. The Contractor shall require that the manufacturer of the chiller shall furnish the parts and the labor to replace any item found to be defective in the refrigeration equipment, within the guarantee period.
8. In addition to other guarantees, the Contractor shall furnish free maintenance for the refrigeration equipment, including replacement of refrigerant and oil, for a period of one year. This shall include regular monthly maintenance and "On Call" service if required.

B. Warranty start on date of acceptance by the Owner.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 INSTALLATION

- A. Workmanship shall be in the best standard practice of the trade.
- B. Install equipment in accordance with the manufacturer's instructions and recommendations unless otherwise noted or specified.
- C. Sequence, coordinate and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots and openings in other building components during progress of construction, to allow for mechanical installation.
 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 7. Coordinate connection of mechanical system with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance and repair or replacement of equipment components, where installed exposed in finished spaces.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specific slope.

3.2 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Division 2 through 16 for rough-in requirements.

3.3 CUTTING AND PATCHING

- A. Perform cutting and patching in accordance with Division 1.
- B. In addition to the requirements specified in Division 1, the following requirements apply:
 1. Protection of Installed Work: During cutting and patching of operations, protect adjacent installations.
- C. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 1. Remove and replace defective work.
 2. Remove and replace work not conforming to requirements of the contract documents
 3. Remove samples of installed work as specified for testing.
 4. Install equipment and materials in existing structures.
 5. Upon written instructions from the Architect, uncover and restore work to provide for Architect/Engineer observation of concealed work.
- A. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new work.
- B. Protect the structure, furnishings, finishes and adjacent materials not indicated or scheduled to be removed.
- C. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- D. Patch existing finished surfaces and building components using new materials matching existing materials and experienced installers. Installer's qualifications refer to the materials and methods required for the surface and building components being patched. Refer to Division 1, for definition of "Experienced Installer".

3.4 SYSTEM OPERATIONAL TESTS

- A. The Contractor shall inform the Owner one week prior to starting this testing in order that the Owner's Representative may be present.
- B. After balancing and prior to final inspection, the contractor shall operate all systems continuously trouble free and stable for a minimum period of fourteen consecutive days including Saturday and Sunday. Each day shall be a 24 hour day for buildings with 24 hour operation and an 8 hour day for buildings with 8 hour and less operating schedules. Should a problem arise, the 14 day period shall be restarted and repeated until successfully operated for a full 14 days. A written report certified by the Owner's Representative shall indicate the successful completion of a stable and trouble free 14 day period.

3.5 CLEANING

- A. Cleaning shall be done as the work proceeds. Periodically remove waste and debris to keep the site as clean as is practical.
- B. Refer to Division 1 for general requirements for final cleaning.
- C. Leave exposed parts of the mechanical work in a neat, clean and usable condition, with painted surfaces unblemished and plated metal surfaces polished.
- D. Thoroughly clean all materials, equipment and appliances. Clean and prepare all surfaces to be painted. Clean the entire premises of unused materials, debris, spots and marks to the satisfaction of the Architect.

END OF SECTION