DIVISION 15

Intentionally Left Blank

SECTION 15010

GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE OF DIVISION

A. Work shall include all materials, equipment and labor necessary for a complete and properly functioning mechanical installation in accordance with all applicable codes, and contract drawings and specifications. Work shall include all work specified in Division 15, Mechanical, Section numbers 15000 through 15999.

B. Pay for all required licenses, fees, inspections and permits.

1.03 RELATION TO OTHER WORK

A. Work Not in Division 15: Related work not included in this division consists of requirements given in the following as may be included in the contract documents:

1. Other divisions which may include work (such as concrete, steel, painting, ceiling systems, structure and other work) related to the work of Division 15.

B. Work of Division 15: Any or all sections of Division 15 may include a paragraph or paragraphs under the heading, "Relation to other Work". Where such a paragraph is indicated and work directly related to the section is listed or described, such work shall be considered as relating directly to the indicated section. Any related work (directly related or otherwise) which may be omitted by reference from the "Relation to Other Work" paragraph of such section(s), shall be provided as necessary and required whether or not such work is included by reference. Such listing or description of related work within a section is given only as a convenience to the Contractor; omission of other related sections or described work does not in any way exclude the provision of such work.

1.04 CODES

A. Install all work in accordance with the latest edition of all applicable regulations and governing codes, including the regulations of the utility companies serving the project.

B. Where a conflict in code requirements occurs the more stringent requirement shall govern.

1.05 STANDARDS

A. All equipment and devices shall bear U.L. label, the label of an industry recognized approved testing agency or A.G.A. certification for said item of equipment or device.

B. All electrical devices must be U.L. approved.

1.06 DRAWINGS

A. Architectural and structural drawings take precedence over mechanical drawings with reference to the building construction. Mechanical drawings are diagrammatic and indicate the general arrangement and extent of work. Architectural drawings indicate more exactly the desired relationship between diffusers, registers, lighting fixtures, equipment, electric panels and devices, plumbing fixtures, and other items which remain exposed in the completed building. Exact locations and arrangement of materials and equipment shall be determined, with the acceptance of the Architect/Engineer, as work progresses to conform in the best possible manner with the surroundings and with the adjoining work of other trades. Where locations of equipment, devices or fixtures are controlled by architectural features, establish such locations by referring to dimensions on Architectural drawings and not by scaling drawings.

1.07 DISCREPANCIES

A. In case of differences between drawings and specifications, or where drawings and specifications are not clear or definite, the subject shall be referred to Architect/Engineer for clarification and instructions.

1.08 ELECTRICAL PROVISIONS

A. Work of Division 15 shall include the electrical requirements which are indicated to be integral with mechanical work and which can be summarized to include (but not necessarily be limited to) the following:

1. Motors.

2. Motor starters.

3. Wiring from mechanical equipment to electrical work termination (junction box or disconnect switch).

4. Control switch, pilot lights, interlocks and similar devices.

5. Electrical heating coils and similar elements in mechanical equipment.

6. Electrical work specified in Division 15 for the HVAC control system.

7. Drip pans to protect electrical work.

B. Motors, Starters, Switches: Provide with all motorized mechanical equipment unless otherwise indicated.

C. Drip Pans: Where possible, do not run mechanical piping directly above electrical (or electronic) equipment which is sensitive to moisture; otherwise provide drip pans under mechanical piping. Locate pan below piping, and extend 6" on each side of piping and lengthwise 18" beyond equipment. Fabricate pans 2" deep, of reinforced sheet metal with rolled edges and soldered or welded seams; 20 gage copper, or 16 gage steel with 2 oz. zinc. finish hot dipped after fabrication. Provide 3/4" copper drainage piping, properly discharged.

D. Motors: Unless specifically specified otherwise in the section covering the driven equipment (or the equipment drives), motors shall comply with the following:

1. Three Phase: NEMA design B, three-phase, squirrel cage induction type designed for 1800 rpm synchronous speed for operation in 40°C ambient at 1.15 service factor at constant speed on the scheduled voltage. Motors shall be insulated with Class B insulation material and shall be cast iron, drip proof, horizontal foot mounted type with ball bearings. Two speed motors shall be provided as scheduled and shall be two winding type.

2. Single Phase: Squirrel cage induction type designed for 1800 rpm synchronous speed for operation in 40°C ambient at 1.15 service factor at constant speed on the scheduled voltage. Motors shall be insulated with Class B insulation materials and shall be two winding capacitor start type with steel enclosure, drip proof, horizontal foot mount and ball bearings.

3. Electric motors which are designated to be high efficiency type shall also comply with the section describing high efficiency motors.

E. Scheduled Horsepower: The horsepowers scheduled or specified are those nominal sizes estimated to be required by the equipment when operating at specified duties and efficiencies. In the case of pumps, these horsepowers are non-overloading and may also include provisions for future planned impeller changes. If the actual horsepower for the equipment furnished differs from that specified or shown on the drawings, it shall be the Contractor's responsibility to insure that proper size feeders, breakers, starters, etc. are provided at no change in contract price.

F. Any TEFC motors shall have Class F insulation.

G. Drip proof protected motors shall have Class B insulation.

H. Manufacturer: Electric motors, complying with the requirements of this Section and the installation and performance requirements of the plans, by the following manufacturers are acceptable:

1. Reliance Electric
2. Gould Electric
3. General Electric
4. Westinghouse

I. Motors, Starters and Switches

1. Combination starters with integral disconnect switches: Starters shall be across-the-line magnetic type starter with fused motor circuit protection or circuit breaker (magnetic only breaker) disconnect, rated in accordance with NEMA Standards, sizes and horsepower rating. Final magnetic setting of MCP shall be field set and recorded. Unit shall be mounted on NEMA I enclosures for indoor mounting and NEMA 3R enclosure for outdoor. Starters shall be equipped with double break silver alloy contacts. All contacts shall be replaceable from front without removing starter from enclosure. Overload relays shall be provided in each phase, and shall be melted alloy or bimetallic type. Thermal units shall be of the one-piece construction and interchangeable. Provide time delay

current limiting type fuses. Combination starter shall be rated 22,000 AIC Symm. minimum or as noted on drawings.

2. Starters shall be equipped with auxiliary contacts as required for proper control functions and/or as shown on the drawings; minimum of two normally open auxiliary seal-in interlock and shall be suitable for the addition of at least two additional external electrical interlocks, one normally open and one normally closed. All starters shall have red "run" pilot light, "Hand-Off-Auto" selector switch, overload reset and nameplate. Control voltage shall be as required. Starters shall contain fused control transformers to provide correct control voltage.

3. Provide for all motors or motor-compressors of 5 horsepower and above three phase power monitor as manufactured by Time Mark Corporation (Model #A258B, for 480V, 3 phase systems) (Model #258B for 208V/240V, 3 phase systems) (Model #B258B for 120V systems) providing solid state protection by opening starter for loss of any phase, low voltage of any or all phases, and phase reversal. Monitor shall be installed within the starter enclosure and field adjustable for drop-out voltage of (340-480VAC) (160-240VAC) (85-125VAC)

1.09 ELECTRICAL/MECHANICAL WORK

A. Definitions: Definitions for the purpose of mechanical/electrical control and power coordination are as follows: (Note: The use of the words, "Provide", "furnish" and "install" are intended only for use in describing the coordination indicated by this paragraph and do not necessarily have the same definitions when used outside of the context of this paragraph.) Any items which do not fall within the scope of this paragraph shall be coordinated as individually specified.

1. "Furnish" means to procure an item and to deliver it to the project for installation.

2. "Install" means to determine (in coordination with others as necessary) the appropriate intended location of an item and to set and connect it in place.

3. "Provide" means to both furnish and install.

4. Power Circuit: Circuit which carries main electric power to apparatus to which the power circuit is connected.

5. Control Circuit: Circuit which carries electrical signals directing the performance of a controller but which does not carry the main electric power. (See NEC, Section 430-71.) Such circuits shall also include those which serve a dual control and power function (e.g., a line voltage thermostat circuit which both activates and powers a small fan motor).

6. Controller: A device, or group of devices, which serves to govern, in some predetermined manner, electric power delivered to apparatus to which the controller is connected and includes any switch or device normally used to start and stop a motor. (See NEC, Article 100, Definitions, "Controller", and Section 430-81(a).)

7. Control Device: A device which reacts to an operating condition (pressure, temperature, flow, humidity, etc.) and which initiates transmission of an electrical control signal which causes operation of a controller or which causes operation of pressure switches, etc.

8. Auxiliary Control Device: A device (such as a low voltage control transformer, electric relay, etc.) which is located in a control circuit and which carries or responds to (but does not initiate) an electrical control signal initiated by a control device.

B. Work of Division 15 includes (but is not necessarily limited to):

1. Provide:

a. All controllers which are generally manufactured or shipped as integral with Division 15 equipment (such as starters packaged with air cooled chillers, etc.).

b. All electric motors and other electrical power consuming equipment (such as electric air heating coils, electric boilers, electric hot water heaters, etc.) which are specified in Division 15.

c. All control circuits (including conduit and boxes) from the Division 16 panels to point of use including the necessary circuit breakers.

d. All other control circuits, including conduit and boxes.

e. All control connections to equipment.

f. All control connections to controllers, switches, motors and other mechanical systems electrical power consuming equipment (such as electric air heating coils, electric boilers, electric hot water heaters, etc.).

g. Auxiliary control devices.

h. All control devices (thermostats, pressure switches, flow switches, humidistats, etc.) and make control circuit connections thereto.

i. Any and all pneumatic and electronic and electric control devices and electric or pneumatic connections thereto.

2. Furnish:

a. All controllers which are generally manufactured and/or shipped as separate but companion items to Division 15 equipment (such as centrifugal chiller starters which are matched with the chillers but are not physically an integral part of the chiller assembly.)

C. Work of Division 16 includes (but is not necessarily limited to):

1. Provide:

a. All power circuits, including conduit and boxes.

b. All power connections to controllers, switches, motors and other mechanical systems electrical power consuming equipment (such as electric air heating coils, electric boilers, electric hot water heaters, etc.).

c. All remote motor disconnects (remote from the related controller) at all locations required by NEC and connections thereto except those disconnects which are specified in Division 15 to be provided as part of the equipment itself.

d. All controllers (except those which are generally manufactured or shipped as separate but companion items to Division 15 equipment such as centrifugal chiller starters).

2. Install:

a. All controllers which are generally manufactured and/or shipped as separate but companion items to Division 15 equipment (e.g., chiller starters).

1.10 AUXILIARIES AND ACCESSORIES

A. Include all auxiliaries and accessories for complete and properly operating systems.

1.11 INVESTIGATION OF SITE

A. Check site and existing conditions thoroughly before bidding. Advise Architect/Engineer of discrepancies or questions noted before bidding.

1.12 COORDINATION

A. Provide all required coordination and supervision where work of this division connects to or is affected by work of others.

1.13 PROVISIONS FOR OPENINGS

A. Provide all openings required for work performed under Division 15. Provide sleeves or other approved methods to allow passage of items installed under any Section of Division 15.

1.14 INTERRUPTION OF EXISTING SERVICES

A. Any interruption of existing services shall be coordinated in advance with the Owner's Representative. Shutdown time and duration of critical services shall be decided by the Owner. Contractor shall provide shutoff valves at point of tie-in to minimize downtime.

1.15 CLEANING AND PROTECTION

A. Ductwork: Keep the interior of the duct system free from dirt and rubbish and other foreign matter. All fan motors, switches, and other items, shall also be protected from dirt, rubbish and other foreign matter during building construction. Thoroughly clean all components of the ductwork and remove all dirt, scale, oil and other foreign substances which may have accumulated during the installation process.

B. Equipment: All mechanical equipment provided shall be thoroughly cleaned of all dirt, oil, concrete, etc. Any dents, scratches or other visible blemishes shall be corrected and the appearance of the equipment made "like new" and to the satisfaction of the Architect/Engineer.

C. Upon completion, and before final acceptance of the work, all debris, rubbish, leftover materials, tools and equipment shall be removed from the site.

D. Protection of Work Until Final Acceptance: Protect all materials and equipment from damage, entrance of dirt and construction debris from the time of installation until final acceptance. Any materials and equipment which are damaged shall be repaired to "as new" condition or replaced at the direction of the Architect/Engineer. Where factory finishes occur and damage is minor, finishes may be touched up. If, in the opinion of the Architect/Engineer the damage is excessive, factory finish shall be replaced to "new" condition.

1.16 PRIOR APPROVAL

A. Where the name of manufacturers or products of specific manufactures are mentioned in these specifications and do not include the phrase "or equivalent", it is intended that the Contractor shall furnish the items as specified, and the bid shall be based upon such items.

B. Where the phrase "or accepted equivalent" is included, the manufacturer must submit in writing to the Architect no later than 10 working days prior to the bid date and shall include catalog numbers. Complete catalog cut sheets, computerized performance selection data, physical dimensions, electrical power requirements, wiring diagrams, operating manuals, parts lists, manufacturer's certifications, operating weights and load distribution data, and complete manufacturers' specifications including all applicable options for evaluation. Submittals sent directly to the Engineer or discussed verbally submitted less than 10 working days prior to bid will not be considered. Substitute materials accepted for bidding will be published in an addendum prior to the bid date. Materials not published in an addendum prior to bid date and not previously specified or accepted are considered not accepted and may not be bid by the Contractor. No notice will be provided relative to materials deemed not acceptable.

C. The Contractor shall verify the availability of all equipment and materials he proposes to use in the execution of his contract prior to submitting same for acceptance. The discontinuance of production of any materials or equipment after shop drawing review has been given shall not relieve the Contractor from furnishing and installing an Architect/Engineer accepted alternate equipment and/or material of equivalent quality and style without additional cost to the Owner.

1.17 SHOP DRAWINGS

A. Submit shop drawings for all items, services and systems included in the project.

B. Shop drawings shall clearly show the following:

1. Technical and descriptive data in detail equal to or greater than the data given in the item specification. Indicate all characteristics, special modifications and features. Where performance and characteristic data is shown on the drawings or specified, submitted data shall be provided in a degree which is both quantitatively and qualitatively equal to that specified and shown so that comparison can be made. Present data in detail equal to or greater than that given in item specification and include all weights, deflections, speeds, velocities, pressure drops, operating temperatures, operating curves, temperature ranges, sound ratings, dimensions, sizes, manufacturers' names, model numbers, types of material used, operating pressures, full load amperages, starting amperages, fouling factors, capacities, set points, chemical compositions, certifications and endorsements, operating

voltages, thicknesses, gauges and all other related information as applicable to particular item.

2. Exceptions to or deviations from the contract documents. Should Architect/Engineer accept any items having such deviations which are not clearly brought to Architect/Engineer's attention, in writing, on item submittal, then Contractor is responsible for correction of such deviations regardless of when such deviations are discovered.

C. Additional Requirements: See specific sections of the Specifications for any additional requirements.

1.18 SHOP DRAWINGS TECHNICAL INFORMATION BROCHURE

A. Submit within thirty days after Notice to Proceed. Each brochure shall consist of an adequately sized, hard-cover, 3-ring binder for 8-1/2" X 11" sheets. Provide correct designation on outside cover and on spine of binder, i.e., mechanical. All shop drawings shall be submitted at one time; partial submittals will not be accepted.

B. First sheet in the brochure shall be a photocopy of the "Division 15 Index" for these specifications. Second sheet shall be prepared by the Contractor and shall list Project addresses for this Project for Contractor and all major subcontractors and suppliers.

C. Provide reinforced separation sheets tabbed with the appropriate specifications section reference number and typed index for each section.

D. Shop drawing technical and descriptive data shall be inserted in the brochure in proper order on all items. Mark the appropriate specification section or drawing reference number in the right hand corner of each item. Provide complete information, including, but not limited to, wiring and control diagrams, scale drawings showing that proposed substitute equipment will fit into allotted space (indicate all service access, connections, etc.), test data, and other data required to determine if equipment complies fully with the specifications. All typewritten pages shall be on contractor or equipment manufacturer printed letterhead.

E. At the end of the brochure, provide and insert a copy of the specifications for Division 15 and all addenda applicable to this Division.

F. Submit not less than six brochures. Provide separate tag marking on an individual copy for the Owner, Architect, Engineer, Contractor, Subcontractor (two copies).

G. Contractor shall review the brochure before submitting. Submittal information on each item in each brochure shall bear the Contractor's stamp of approval, initials of checker and date checked by him. No request for payment of or substitutions will be considered until brochure has been reviewed by the Contractor and submitted for checking.

1.19 OPERATING INSTRUCTIONS

A. Submit for checking a specific set of written operating instructions on each item which requires instructions to operate. After acceptance, insert information in each Technical Information Brochure. Refer also to other sections which may describe operating instructions.

1.20 MAINTENANCE INFORMATION

A. Submit for acceptance Maintenance Information consisting of manufacturer's printed instruction and parts lists for each major item of equipment. After acceptance, insert information in each Technical Information Brochure. Refer also to other sections which may describe maintenance.

1.21 MANUFACTURER'S CHECK-OUT

A. Check out by Manufacturer's Representative (for major items of equipment): At completion of construction and after performance verification information as above-mentioned has been gathered, submitted and accepted, provide one copy of this information to the manufacturer's representative. Work required under this section shall include having the representative examine the performance verification information, check the equipment in the field while it is operating, and sign a Check-Out Memo for record. Submit a copy of the memo on each major item of equipment for each brochure. Accepted memos shall be inserted on each brochure with the performance verification information and submittal data. Memos shall be submitted and accepted before Instruction in Operation to Owner or a request for final inspection.

1.22 SYSTEM GUARANTEE

A. The work required under Division 15 shall include a one year guarantee for all items within the dwelling unit and all components of a system which serves only that unit and a three year guarantee for all other common area items. This guarantee shall be in accordance with Florida Administrative Code Statute 718.203. This guarantee shall be by the Contractor to the Owner to replace for the Owner any defective workmanship, equipment, or material which has been furnished under this Contract at no cost to the Owner for a period of one or three years from the date of acceptance of the System. This guarantee shall also include reasonable adjustments of the system required for proper operation during the guarantee period. Explain the provisions of guarantee to Owner at the "Instruction in Operation Conference".

1.23 INSTRUCTION TO OWNER

A. Submit all required items for checking one week before final inspection of the building is scheduled. When all items are accepted and placed in the proper brochures, the Contractor shall give notice in writing that he is ready to give the Owner an "Instruction in Operation Conference". After the above mentioned request is received the Contractor will be notified of the time the conference can be held with the Owner. At the conference, the Contractor shall review with the Owner all appropriate information. At the end of the conference, seven copies of a memo certifying Instruction in Operation and Completed Demonstration shall be signed by the Contractor, Subcontractor and Owner and one copy inserted in each brochure.

1.24 MATERIALS AND EQUIPMENT

A. Each bidder represents that his bid is based upon the materials and equipment described in this division of the specifications.

1. Submittal shall include the name of the material or equipment for which it is to be substituted, substituted equipment model numbers, drawings, cuts, performance and test data and any other data or information necessary for the Architect/Engineer to determine that the equipment meets all specification and requirements. If the Architect/Engineer accepts any proposed substitutions, such acceptance will be set forth in writing.

2. Substituted equipment with all accessories installed or optional equipment where permitted and accepted, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether accepted or not, shall be replaced at the Contractor's expense. Any modifications of related systems of this or other trades as a result of substitutions shall be made at the Contractor's expense, and Contractor shall so state in his written request for substitution.

1.25 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers: Materials and Equipment specified in these contract documents are accepted only in regards to general performance and quality. It shall be the Contractor's responsibility to insure that acceptable materials and equipment meet or exceed the efficiencies, capacities, electrical characteristics, performance and quality of the equipment herein specified. Acceptable equipment must also generally conform, without extensive modification of related systems to the accessories, weights, space and maintenance requirements, etc., of the specified equipment. Any modification to related systems of this or other trades shall be made at the Contractor's expense and the Contractor shall be responsible for coordination between trades. Any difference in capacity, efficiency, electrical characteristics, weights or quality of product, etc., between specified materials and equipment and acceptable alternates shall be submitted to the Architect/Engineer for acceptance within 30 days of Notice to Proceed.

END OF SECTION 15010

SECTION 15050

MECHANICAL BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section, in addition to the following:

1. Other divisions which may include work (such as concrete, steel, painting, ceiling systems, structure and other work) related to the work of Division 15.

1.02 SCOPE

A. Materials listed herein are general mechanical materials to be used under the Division 15 sections of the specifications unless specifically noted otherwise in the particular section or on the drawings.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications. This section relates to all sections of Division 15 as may be applicable to the work of each section.

1.04 STANDARDS

A. Quality and weight of materials shall comply with requirements and specifications of the appropriate standards of the American Society of Testing and Materials.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT, GENERAL

A. All materials and equipment shall be new and without blemish or defect.

B. Equipment and materials shall be products which will meet with the acceptance of the agency inspecting the work. Where acceptance is contingent upon having the products examined, tested and certified by Underwriters Laboratory or other recognized testing laboratory, the product shall be so examined, tested and certified.

C. Where no specific indication as to the type or quality of material or equipment is indicated, a standard item or system shall be furnished with all options, features and capabilities to meet the project requirements.

D. Performance and Capacity:

1. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance. In some cases equipment may be sized to allow for future requirements or for other reasons which may not be stated on the Drawings or in the

Specifications; provide equipment and systems with the capacities, capabilities and features indicated to provide the maximum or minimum (as appropriate) conditions.

E. Operating conditions and capacities must be as follows:

1. No overloading.

2. No operation at conditions outside of maximum and minimum limits recommended by the manufacturer and accepted by the Architect/Engineer.

3. Compatible with all systems.

F. Unless otherwise specified, all equipment and materials furnished must be as follows:

1. Recommended by the manufacturer for the application.

2. Installed in accordance with the manufacturer's recommendations for the application except where specifications and drawings clearly indicate otherwise.

2.02 ACCESS DOORS AND PANELS

A. Locations: Provide access doors and panels (access units) as necessary for access to items which are concealed and which may require service or maintenance or other reason for accessibility. Examples of such items include, but are not limited to, the following: valves, cleanouts, pipe unions, expansion joints and connectors, dampers, coils, junction boxes, duct heaters, terminal units, HVAC control system devices and similar types of items.

B. Access units: Shall be manufactured by the Milcor Division of Inland-Ryerson, Boico, Nystrom or Ventfabrics. Types are as follows (Milcor style designations are used for example only):

Location	Door/Panel Type
Drywall	Style "DW"
Masonry or tile	Style "M-stainless"
Acoustical tile	Style "AT"
Plaster	Style "K"
Fire-rated walls	Style "Fire Rated"**
(**or as indicated below)	

C. Fire Rated Units:

1. Frame and panel assembly shall bear a U.L. label reading, "frame and door assembly, rating 1-1/2-hour (B), temperature rise 30 minutes 250°F maximum".

2. Have an automatic closing device and mechanism to release the latch bolt from the inside.
3. Acceptable Manufacturers: Boico Style F, Inryco/Milcor Style VA, Nystrom Style APFR.

D. Non-fire Rated Units:

1. Steel panels and frames.

2. Locks and latches shall be as appropriate for the location and shall be cam-lock type latches, flush screw driver operated locks or cylindrical locks.

3. Provide two keys for all doors. All doors shall be keyed the same.

E. Other Requirements:

1. Doors and panels installed in glazed or ceramic tiled surfaces, in toilet rooms or in kitchens shall be stainless steel.

2. Unless otherwise indicated, finish shall be rust inhibitive prime coat.

F. Sizes:

1. Minimum size: 8" X 8".

2. Sizes of each unit shall be individually selected to allow the recommended and required service and maintenance and accessibility functions to be accomplished. These functions shall generally include, for example, valve removal, damper linkage resetting, control adjustment, lubrication, repair, replacement and similar tasks as may be necessary and recommended for the concealed item.

3. Sizes shall be of the following increments (unless otherwise approved) to allow the accessibility function to be accomplished: 8" x 8", 8" x 12", 12" x 12", 12" x 16", 16" x 16", 16" x 24", 24" x 24", 24" x 36", 30" x 30", 36" x 36" or 36" x 48".

4. No size smaller than 16" x 24" shall be allowed when a person must pass through the access opening in order to accomplish the desired accessibility function.

2.03 PAINTING AND MARKING

A. All paint and materials used for painting shall be manufacturer's "first quality" product. For additional paint material requirements, refer to Section 09900, Painting.

B. Marking: Refer also to sections describing identification of mechanical systems.

2.04 FLOOR, WALL OR CEILING PLATES OR ESCUTCHEONS IN EXPOSED AREAS

A. Shall be chrome-plated. Escutcheons for extended sleeves shall be of the type designed for that purpose. Split ring escutcheons will not be allowed.

B. Escutcheons to be as manufactured by Guarantee Specialty Mfg. Co., Cleveland, Ohio; American Sanitary Mfg. Co., Abingdon, Ill., or Beaton Cadwell.

C. Provide escutcheons or fabricated plates or collars at each location where pipe or duct passes through a finished surface. Escutcheons for flush sleeves shall be equivalent to Benton & Caldwell No. 3A chromium plated brass; for sleeves extending above floor shall be equivalent to Benton & Caldwell No. 36 chrome plated brass. Collars or plates for ducts and large diameter insulated pipe shall be fabricated of 18 gage galvanized copper bearing sheet steel, secured to structure and neatly fitted around duct or pipe.

2.05 SLEEVES

A. General: Lay out work and set sleeves in new or existing construction so there shall be minimum of cutting, drilling and patching. All sleeves not used during construction period shall be sealed using grout. Unused penetrations or sleeves through fire rated barriers shall be sealed to prevent passage of smoke or heat using an Underwriters' Laboratories approved method rated at least equivalent to the barrier being penetrated. Method submitted must show proof of UL approval.

B. Pipe Sleeves: Except where specified otherwise below, pipe sleeves shall be as follows:

1. Sleeves installed in walls subject to hydrostatic (water) pressures shall be "link seal" (Thunderline Corp.) Type WS or accepted as equivalent.

2. When there is piping existing, and fire rated walls are to be erected, Proset fire rated split wall system pipe sleeves, or accepted equivalent, are to be used.

3. When copper or steel slab penetrations are required, use Proset System A, or accepted as equivalent for fire-rated and water pipe installations.

C. Walls and Partitions:

1. Sleeves 8-Inch Diameter and Smaller (Above Grade): Sleeves shall be mild steel pipe or plastic sleeves built into wall, partition or beam, sized to pass pipe and covering, leaving a clear space of 1/4-inch minimum between covering and sleeve. Penetrations of fire rated barriers shall have mild steel sleeves.

2. Sleeves Installed in Exterior Walls (Below Grade): Schedule 40 steel hot dipped galvanized after fabrication or cast iron sleeve with 1/4-inch x 3-inch center flange (water stop) around the outside.

D. Floors (Above Grade): Sleeves shall be Schedule 10 galvanized steel, set before floor is poured, sized to pass pipe and covering, leaving a clear space of 1/4-inch between covering and sleeve, and shall extend 1/2-inch above finished floor.

E. Duct Sleeves: Sleeves or openings sized to pass mechanical ducts and covering shall be of framed construction in roof, wall, or partitions.

F. Sealing of Sleeves:

1. Sleeves Below Grade: Caulk annular space between pipe and sleeve using oakum and poured lead both sides minimum one inch deep to make wall penetration water tight.

2. Sleeves Above Grade: Openings around pipes, duct, etc., passing through sleeves shall be made draft free and vermin-proof by packing solidly with mineral wool or fiberglass.

3. Sealing of Sleeves Through Fire Rated Barriers: All penetrations through fire rated barriers shall comply with Section 15050-3.06.

2.06 FIRE/SMOKE RATED FLOOR, PARTITION OR WALL PENETRATION SEALANT

A. Seal shall be composed of fire barrier product, putty, or caulking materials used either in combination or singularly. Acceptable Manufacturers are 3M Corporation or Dow Corning. The "Proset" System may be used at piping floor penetrations.

2.07 EXCAVATION AND BACKFILL

A. Provide as necessary to accomplish work specified. Perform in accordance with applicable State and Local codes and accepted good practice and in accordance with other applicable sections or divisions.

2.08 BELT DRIVES

A. General: Equip each motor driven machine not direct connected with V-belt drive. Belts shall be of correct cross section to fit properly in sheave grooves and shall be carefully matched for each drive. Sheaves shall be cast iron or steel, bored to fit properly on shafts and secured with keys of proper size. The rating of each drive shall be as recommended by manufacturer for service but shall be at least 1.5 times nameplate rating of motor.

B. Speed Adjustment: Adjust fan speed by change(s) in sheave size as necessary to obtain proper design air flow with fan in its installed location. Fans may be first fitted with variable pitch drives until proper speed adjustment is made and then fitted with proper fixed pitch drive size, or alternate sizes of fixed pitch drives may be used until proper fan needed to deliver necessary air quantity.

C. Vibration of Air Handling Equipment and Fan Units: For air handling equipment and fans driven by motors 5-hp or greater, field vibration levels will not be acceptable if the maximum vibration velocity or displacement measurement exceeds the following values (when measurements are taken at the bearing supports using a vibration analyzer with the filter set at the operating fan speed):

Fan Speed (RPM)	Maximum Vibration Level
800 or Less	5 Mils (0.127 mm) max. displacement
801 and Greater	0.20 in/sec. (5 mm/s) max. velocity

D. Belt and Coupling Guards: Each belt drive shall be equipped with an OSHA approved guard. Guards shall be constructed of #12 U.S. standard gage 3/4-inch diamond mesh wire screen, or equivalent, welded to one inch steel angle frames, and shall enclose all belts and sheaves. Tops and bottoms of guards shall be of substantial sheet metal or not less than #18 U.S. standard gage. Braces or supports must not "bridge" sound and vibration isolators. Guards shall be designed with adequate provision for movement of motor required to adjust belt tension. Means shall also be provided to permit oiling, use of speed counters, and other maintenance and testing operations with guard in place. All direct drive equipment shall have coupling guards in accordance with Florida Department of Business Regulation safety regulations and OSHA.

2.09 BEARINGS

A. All bearings shall be 200,000-hour rated unless otherwise specified.

PART 3 - EXECUTION

3.01 EQUIPMENT ACCESS

A. Access Doors and Panels:

1. Locations: Provide access unit at the following locations.

   a. Where additionally specified in other sections of this Division 15 and where specifically indicated on the drawings.

   b. Where not specifically indicated on the drawings but where the work to be provided will require accessibility for purposes as described or as recommended by the manufacturer of the concealed item.

   c. At all locations where concealed equipment, fixtures, devices and similar items require accessibility for service, inspection, maintenance, repair, replacement and where such concealed item would not otherwise be accessible for such functions without the provision of an appropriately sized access unit.

B. Installation

1. Definitions: For the purpose of coordination of responsibility, the following words are defined to describe the intended coordination.

   a. "Furnish" means to procure an item and deliver it to the project for installation.

   b. "Install" means to determine (in coordination with others as necessary) the intended appropriate location of an item and to set, connect and otherwise fix in place in a manner to allow intended operation and use.

   c. "Provide" means to both furnish and install fully and completely in all aspects.

2. Furnishing Access Units: Access units shall be furnished as work of the Division which governs the item which is intended to be made accessible by the access unit.

3. Installing Access Units: Access units shall be installed as work of the Division which governs the surface, barrier, partition or other building component in and on which the access unit is to be placed.

4. Determination of Locations:

   a. Where the work of Division 15 requires that the access unit be provided (i.e., both furnished and installed), then the responsibility for determination of the location at which the access unit is to be placed is also work of Division 15.

   b. Where the work of Division 15 requires that access unit be furnished for installation as work of another Division, then the responsibility for determination of the location at which the access unit is to be installed shall be work of Division 15. Conversely, where the work of one Division requires that an access unit be only installed, then the responsibility for determination of the location of which the access unit is to be installed shall be work of Division 15 which furnishes the access unit.

5. Determination of Sizes:

a. Unless an access unit size is indicated on the drawings or otherwise specified, the size of each access unit shall be determined as work of the Division which either provides or furnishes the access unit.

b. Sizes for access units which are provided or furnished as work of this Division shall be in compliance with sizing criteria of this Division.

3.02 PAINTING

A. See architectural specifications for mechanical equipment and piping, painting requirements.

B. Factory painted or finished items do not require field painting but shall require "touch-up" with matching paint or finish where scratched.

3.03 ANCHORS

A. Install a suitable anchor on piping to prevent movement from expansion and contraction by welding or clamping securely to pipe at fitting or coupling. Approval of the Architect/Engineer of method of anchorage must be obtained before installation of work. Properly anchor piping to remove strains on equipment which would be caused by expansion and contraction. Adequately insulate anchors on piping, with operating fluid temperatures below 75°F, to prevent moisture condensation problems.

3.04 EXPANSION AND CONTRACTION PROVISIONS

A. Piping is designed with offsets and loops to provide for expansion and contraction. At such points, piping shall be cold sprung to equalize expansion when at operating temperatures. Install piping to maintain grade at all operating temperatures.

3.05 FLASHING

A. Flashing shall be done as work of other divisions.

3.06 PIPING SLEEVES

A. Contractor shall furnish and set sleeves for his piping. Use galvanized sheet steel with water tight seams and joints or pipe for poured concrete. Extend sleeves thru walls, partitions and ceilings to finished surface. Extend sleeves 1/4 inch above finished concrete floors and 1 inch above slab in chases. Sleeves, installed above finished ceilings, for fire/smoke rated wall assemblies shall extend 1" beyond each face of wall.

B. Adequately size sleeves to permit clearance for pipe movement and proper grading of pipes. Sleeves for insulated pipe shall be of adequate size to clear insulation.

C. Caulk space between insulation or pipe and sleeve where required with fire rated safing material (or flexible fire retardant sealant if pipe is subject to expansion or contraction) to serve as a fire and smoke stop.

D. Sleeves in walls and/or slabs subject to hydrostatic pressures shall be made water tight.

3.07 ESCUTCHEONS

A. Provide chrome plated brass escutcheons (for 1/4 or 1 inch projecting sleeves as required) at each point where an uninsulated pipe passes through a finished surface.

3.08 CONCRETE BASES AND STRUCTURAL STEEL

A. Concrete bases and structural steel to support equipment and piping installed under each specification section or division and not specifically shown on the structural or architectural plans shall be furnished for this work.

3.09 SEALANT

A. Fire/smoke sealant shall be installed in strict compliance with the manufacturer's installation instructions.

END OF SECTION 15050

SECTION 15052

INSTRUCTIONS AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Provide complete written and verbal operating and maintenance instruction to the Owner for all mechanical systems.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

B. This section directly relates in particular to sections which describe the following:

1. Valves and piping systems components requiring maintenance and which are involved in the dynamic function of the systems.

2. Pumps and related flow devices.

3. Plumbing equipment.

4. HVAC equipment.

PART 2 - PRODUCTS

2.01 INSTRUCTIONS AND MAINTENANCE MANUALS

A. Provide three Instructions and Maintenance Manuals, each complete as follows:

1. Hardback three-ring loose-leaf binders.

2. Title sheet with job name, Contractor's, subcontractor's control subcontractor and related contractor's or material supplier's names, addresses and phone numbers.

3. Index of contents.

4. A signed copy of acknowledgement of instructions to the Owner or his authorized representative. Two additional copies of the signed acknowledgement shall be sent directly to the Architect as soon as possible after receipt.

5. Typewritten operating instructions for the Owner's personnel describing the following for each piece of equipment and systems:

   a. How to start and stop each piece of equipment.

   b. How to set equipment and systems for normal operation.

   c. Normal restarting procedures before contacting the service contractor.

   d. Complete description of functions and operations of each piece of equipment including description of how equipment operates in conjunction with automatic control systems.

   e. Instructions for cleaning, oiling, greasing, fueling and similar tasks.

6. Approved shop drawings and submittal data and parts and maintenance booklet for each item of material and equipment furnished under this Division, including (but not limited to) the following:

   a. Spare parts list and source of supply for each equipment item.

   b. List of valves with location, service, size, model and operating position.

   c. Diagrams clearly indicating automatic control hook-up.

7. Any as-built wiring diagrams as called for in other sections of this division as needed to show how equipment controls interface with related systems.

8. Copies of certificates of inspection.

9. Guarantees.

PART 3 - EXECUTION

3.01 VERBAL INSTRUCTION

A. Provide verbal, hands-on, operating and maintenance instruction to Owner's authorized personnel for each equipment item and system. Instruction shall be given by competent personnel.

   1. Duration: Total instruction period for all systems of this Division 15 shall be not less than three (3) working days or as required by owner. The Owner reserves the right to audio-tape or video-tape the instruction procedure.

3.02 MANUFACTURERS' SERVICE REPRESENTATIVES

A. Verbal instruction at the site for the following equipment items and systems shall be given jointly by the contractor and the authorized manufacturer's service representative. (Contractor and manufacturer's service representative shall provide instruction to Owner for each equipment item of no less duration than the hours indicated in parenthesis. Duration shall be greater if otherwise specified).

1. Air Handling Units and Condensing Units (2 hours)

2. Exhaust Fans (2 hours)

END OF SECTION 15052

Intentionally Left Blank

SECTION 15056

HOUSEKEEPING PADS, CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Provide concrete housekeeping pads for the equipment listed in this section. This work shall be performed by the concrete installer.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the drawings and specifications.

B. This section directly related in particular to sections (which may or may not be included in this division) which describe the following:

1. Concrete described in other divisions.

PART 2 - PRODUCTS

2.01 GENERAL

A. All concrete and steel for concrete housekeeping pads shall comply with those sections of the specification division describing concrete and steel.

2.02 HOUSEKEEPING PADS

A. Provide reinforced (#4's @ 12" both ways with 1-1/2" top cover) concrete housekeeping pads for each individual machine. Pads shall extend six inches beyond the machine bases in all directions and be continuous beneath the machine. Pads shall have chamfered edges and shall be poured and finished smooth and level to insure proper and continuous support for the bearing surfaces of the machine.

B. Coordinate exact length and width of each pad and any penetrations which may be necessary for piping or conduit with the actual equipment approved for use on the project.

PART 3 EXECUTION

3.01 GENERAL

A. Refer to the section describing vibration isolation for equipment which is to rest on concrete housekeeping pads.

3.02 PAD HEIGHTS

A. Provide 4" high concrete pads for the following:

1. All equipment specified or shown to be on a concrete pad if no height is given.

2. Compression tank assembly (if floor mounted).

END OF SECTION 15056

SECTION 15062

REFRIGERANT PIPE, VALVES AND SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section. Installation of refrigerant piping system shall be in accordance with "Trane Refrigerant Piping Guidelines and Limitations".

1.02 SCOPE

A. Provide refrigerant piping systems, complete in all respects, between the system components and connected equipment.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SHOP DRAWINGS

A. Refer to the Section entitled "General Mechanical Provisions".

PART 2 - PRODUCTS

2.01 COPPER PIPE

A. Refrigerant system piping shall be refrigerant grade, dehydrated and sealed, seamless, uniformly dead soft temper.

2.02 FITTINGS

A. Refrigerant grade, wrought copper, long radius, solder joint type.

2.03 SOLDER

A. Silver brazing alloy (Sil Fos) Fed. Spec. AA-S-56ld.

2.04 FLUX

A. Non-corrosive, specifically designed for silver brazing.

2.05 ACCESS VALVES

A. Schrader type designed for use with quick coupler hose fittings and provided with individual cap.

PART 3 - EXECUTION

3.01 PIPE SIZES

A. Refrigerant pipe sizes are not shown on drawings. Provide sizes not less than sizes in compliance with size recommended by the manufacturer(s) at the connected equipment. Provide change in sizes if such change is in accord with manufacturer's recommendation and with Architect/Engineer's approval. Size piping to maintain minimum velocity of 500-fpm in horizontal lines and 1000 fpm in vertical risers for proper oil return; provide double suction risers and hot gas risers as may be necessary to accomplish this.

3.02 REFRIGERANT SPECIALTIES

A. Refrigerant valves, driers, expansion valves, and similar items shall be provided with each system. Where refrigerant access valves are not furnished by the manufacturer, they shall be field installed to enable charging and checking the system.

3.03 JOINTS AND CONNECTIONS

A. General: All joints and connections shall be made permanently refrigerant tight.

B. Solder Joints: Cut tubing square using tubing cutters, with sharp cutting wheels, so as not to crimp the tubing ends. Remove all burrs using a pipe reamer and taking care not to flare the ends of the tube. Thoroughly clean the outside of the pipe and the inside of the fitting using a fine sand cloth. Apply non-corrosive paste flux to the cleaned surfaces immediately and apply silver solder and heat in accordance with manufacturer's instructions. Use care not to damage equipment or refrigerant specialty items when making up joints (protect from excessive heat).

C. Scale Prevention: During brazing, keep pipe system full of inert gas to prevent scale formation.

D. Mechanical Joints: Where the Contractor uses refrigerant tubing sets, follow the manufacturer's installation instructions explicitly, including the use of special tools, when making up the joints. Where precharged tubing and equipment is provided, do not cut into the system to install access valves.

3.04 HANGERS AND SUPPORTS

A. Refer to other sections describing hangers and supports. Isolate copper tubing from contact with any dissimilar metals.

3.05 EVACUATION AND CHARGING

A. When other than completely factory charged equipment and piping systems are used, they shall be evacuated and charged as follows: Charge the system with dry nitrogen and refrigerant and leak test all joints including factory piping within the units. Repair all leaks by disassembling and remaking the joint. After all leaks are corrected, evacuate the system to an absolute pressure of 0.2" mercury. System shall hold this vacuum for two hours with no noticeable rise in pressure. After passing vacuum test, break vacuum twice using refrigerant and re-evacuate for a minimum of two hours each time. Charge the system in the manner and with the type and amount of refrigerant recommended by the manufacturer and in accordance with accepted refrigeration practice.

3.06 REFRIGERANT PIPING CONDUIT

A. Install any refrigerant piping which is below slab or grade in Schedule 40 PVC piping. Size conduit as necessary to properly install piping. Provide long bend sweeps. Install so that conduit will drain and not trap water. Protect ends of conduit from entry by vermin, insects and water.

3.07 OTHER REQUIREMENTS

A. Arrange piping generally as shown and such that service access is facilitated. Keep refrigerant lines as short and direct as possible with a minimum number of joints. Provide sleeves through floors, walls or ceilings, sized to permit installation of full-thickness insulation; seal air tight after installation of piping and insulation.

B. Provide flexible piping arrangement in hot gas discharge line of compressor. Such arrangement shall consist of a piping loop or similar measure to prevent transmission of objectional vibration.

C. Provide a removable core filter-drier in liquid line. In-line filter-driers are acceptable in individual circuits of less than 10-ton nominal capacity. Provide a full size valved bypass around this filter-drier. Provide shut-off valves to isolate the filter drier while flow is through the bypass and also a shutoff valve in the bypass so that filter-drier can be put into use.

D. Provide a refrigerant charging connection in the liquid line upstream from the filter-drier.

E. Provide a moisture indicating sight glass in the liquid line downstream from the filter-drier. Install in vertical line if possible and a sufficient distance downstream from any valve such that the resulting disturbance does not appear in the glass.

F. Provide a filter-drier with isolating shut-off valves and with valved bypass only if compressor is not equipped with a suction line filter or screen.

G. Keep piping free from traps unless otherwise indicated. Install vertical pipe plumb. Pitch horizontal piping only where slope is desirable.

H. Provide shut-off valves at inlet and outlet to all condensers, receivers and evaporators to permit isolation for service. If possible, use angle valves to minimize pressure drop. Use angle valves in all cases at receivers. Use globe valves only when angle valves are impractical.

I. Provide solenoid valves upright in horizontal lines only, unless their design allows installation in vertical pipe.

J. Where compressor(s) do not have pump down control and the compressor(s) associated evaporator coil(s) do not have bottom suction header connections and the evaporator coil(s) are located above the compressor(s), then loop suction lines(s) to top level of coil to prevent liquid slugging.

K. To prevent erratic operation of thermal expansion valve, provide a suction line trap next to evaporator coil suction outlet with expansion valve bulb located between coil and trap. Provide only in suction lines which are level leaving coil outlet or which rise on leaving coil outlet. Trap not required when evaporator coil outlet suction line drops to compressor or suction header immediately after expansion valve bulb.

END OF SECTION 15062

Intentionally Left Blank

SECTION 15066

PIPING: CONDENSATE DRAIN

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Provide condensate drain piping from cooling coil drain pans.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

B. This section directly relates in particular to sections (which may or may not be included in this division) which describe the following:

1. Air handling equipment with cooling coils.

2. Insulation.

1.04 SHOP DRAWINGS

A. Refer to Section entitled "General Mechanical Provisions".

PART 2 - PRODUCTS

2.01 PIPE (ABOVE GROUND)

A. Type M hard drawn copper conforming to ASTM Spec. B88.

B. Contractor's option: Cast iron soil pipe service weight, centrifugally cast, ANSI A112.5.1. "Non-Hub" joint.

2.02 PIPE (BELOW GROUND)

A. PVC Type DWV, ASTM D2665-78.

2.03 FITTINGS

A. Wrought copper, solder joint, pressure type conforming to ANSI B16.22.

B. Cast Iron "Non-Hub" conforming to CIPI Standard 301.

C. PVC type DWV, ASTM D-2665, NSF seal of approval, solvent cement joint.

2.04 SOLDER

A. Composition SB5 (95/5), Fed. Spec. QQ-S-571d and Class 3 (Sil Fos), Fed. Spec. AA-S-561d, ASTM B32.

2.05 PIPE JOINTS

A. No-Hub type joints shall be constructed of 24 gauge type 304 stainless steel, with gasket guides, type 304 stainless steel screw clamps, and matching neoprene (ASTM C-564) gasket that shall inter lock with housing.

PART 3 - EXECUTION

3.01 GENERAL

A. Piping shall be sloped uniformly toward drain, and provided with trap seal having a depth, in inches, equivalent to one and one-half (1-1/2) times the total static pressure of the respective fan system. Traps shall be assembled using elbows and tees with threaded brass plugs to permit cleaning of trap and drain line. Piping shall be installed in a neat manner and shall be not smaller than full size of the equipment drain connection or three-quarters inch (3/4") whichever is larger.

3.02 JOINTS AND CONNECTIONS

A. General: Joints and connections shall be made permanently air, gas, and water tight.

B. Solder Joints: Cut pipe square using cutting tool which does not crimp pipe. Remove all burrs using pipe reamer and taking care not to flare the pipe end. Thoroughly clean the outside of pipe and the interior of the fittings using a fine sand cloth. Apply noncorrosive paste flux to the cleaned surfaces immediately and apply solder and heat, in accordance with manufacturer's instructions, to complete joint.

C. Equipment Connections: Connections to copper drain nipples may be made with solder joints provided care is exercised not to damage equipment, its insulation or finish. Connections to equipment having steel nipples shall be made using screwed to solder adapters with teflon tape applied to male threads prior to assembly.

3.03 ROUTING

A. Unless otherwise indicated, route pipe discharge as follows:

1. Roof Mounted Equipment: To nearest roof drain.

2. Interior Equipment: To storm sewer.

3.04 INSULATION

A. Insulate if so specified in section describing insulation.

END OF SECTION 15066

SECTION 15151

HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this Section.

1.02 SCOPE

A. Provide all angles, brackets, clamps, anchors, inserts, rods, braces, frames, hangers nuts and bolts, and other miscellaneous steel and hardware items as may be required for the proper support of equipment, piping systems, HVAC systems, plumbing systems and fire protection systems.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

B. This section directly relates in particular to sections (which may or may not be included in this division) which describe the following:

1. Piping systems.

2. Duct systems.

3. Equipment items.

1.04 SHOP DRAWINGS

A. Refer to Section entitled "General Mechanical Provisions". Provide specific data on hangers, stands, clamps, rollers, guides, shields, anchors and their proposed application. Submit detailed shop drawings, showing method of support and anchoring for all piping and equipment as required:

1.05 MANUFACTURER

A. Products listed in this Section or on the plans are based on a specific manufacturer to establish the desired style, quality and type. Equivalent products, complying with the requirements of this Section and the installation requirements of the plans, by the following manufacturers are acceptable:

1. F&S Manufacturing Corp.
2. Fee and Mason Manufacturing Co.

PART 2 - PRODUCTS

2.01 HANGERS

A. Hangers In Contact With Copper Piping: Shall be copper plated or teflon coated. Hangers shall be Fed. Spec. WW-H-171E, Type 9. Acceptable: Grinnell Fig. 97 or 97C, or equivalent.

B. Hangers (other than in Contact With Copper Piping): Shall have manufacturer's standard finish. Hangers shall be of the following types:

1. Pipe 3" and Larger: Fed. Spec. WW-H-171E, Type 1. Acceptable: Grinnell Fig. 260 or equivalent.

2. Pipe 2-1/2" and Smaller: Fed. Spec. WW-172E, Type 6. Acceptable: Grinnell Fig. 104 or equivalent.

C. All hangers at garages shall be stainless steel.

2.02 ISOLATORS

A. Refer to the Section, if included in this Division, which describes vibration isolation.

2.03 PIPE RISER CLAMPS

A. Pipe Riser Clamps: Shall be Fed. Spec. WW-H-171D, Type 8.

2.04 INSULATION SHIELDS

A. Shall be Fed. Spec. WW-H-171D, Type 41. Acceptable: Grinnell Fig. 167, or equivalent.

2.05 INSERTS

A. Preset Type: Malleable iron with removable interchangeable nuts having lateral adjustment of not less than one and five-eighths inches. Continuous inserts shall have a capacity of 2,000 lb. per foot and shall be hooked over reinforcing. Acceptable: C-B Universal Fig. 282; Unistrut Products Co., P3200 or P3300; B-Line Systems, Inc., Series B- 32.1, or equivalent.

2.06 ROD

A. Carbon steel, black threaded bolt ends or continuous thread, sized with safety factor of five (5). Acceptable: Grinnell Fig. 140 or 146, or equivalent.

B. All rods at garages shall be stainless steel.

2.07 BELOW GRADE PIPE SUPPORTS

A. Below grade pipe hangers shall be type 316 stainless steel straps embeded into concrete slab.

PART 3 - EXECUTION

3.01 GENERAL

A. Refer to Section entitled "General Mechanical Provisions". All inserts, fasteners, hangers and supports shall be installed in strict accordance with manufacturer's instructions.

3.02 PIPE

A. General: Hangers shall be spaced to prevent sag and to permit proper drainage. All piping shall be run parallel with the lines of building, unless otherwise indicated on drawings. The hanger spacing and placement shall be such that after the covering (insulation and finish) is applied, there will be not less than 1/2" clear space between finished covering and other surfaces, including the finished covering of parallel adjacent pipes. Hangers for insulated pipes shall be sized to encompass the insulation, finish and metal insulation shield (a metal insulation shield shall be provided for each hanger or support). Vertical piping shall be supported with pipe riser clamps at every floor penetration, unless specifically indicated otherwise on the drawings or Proset system is used. Hangers and supports shall not be placed at greater than the following intervals:

B. Pipe 1" and Smaller: Eight foot (8') centers and not more than two feet (2') from a change in direction (offsets, elbows, and tees).

1. Pipe 1-1/4" through 2-1/2": Ten foot (10') centers and not more than two feet (2') from a change in direction (offsets, elbows and tees).

2. Pipe 3" and Larger: Fourteen foot (14') centers and not more than two feet (2') from a change in direction (offsets, elbows, and tees).

3.03 EQUIPMENT

A. Equipment supports shall be as otherwise indicated on the drawings or in the specifications.

3.04 DUCTWORK

A. Refer to Sections describing ductwork.

3.05 POWDER (GUNPOWDER) ACTUATED FASTENERS

A. Not allowed.

END OF SECTION 15151

Intentionally Left Blank

SECTION 15191

IDENTIFICATION OF PIPING SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Provide complete identification of the mechanical systems including piping, valves and equipment as noted herein.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

B. This section directly relates in particular to sections (which may or may not be included in this division) which describe the following:

1. Piping and the interconnected equipment and component items for the following systems:

   a. Domestic cold water piping.
   b. Domestic hot water piping.
   c. Condensate piping.
   d. Refrigerant piping.
   e. Fire protection piping.
   f. Rain water piping.

1.04 APPLICABLE PIPING AND RELATED ITEMS

A. Piping and interconnected equipment and component items for the following systems shall be identified. Identification of the following systems shall not preclude the identification of other systems where identification of such other systems may be specified in other sections. Systems requiring identification as work of this section are:

1. Domestic cold water piping.
2. Domestic hot water piping.
3. Condensate piping.
4. Refrigerant piping.
5. Fire protection piping.
6. Rain water piping.

1.05 SHOP DRAWINGS

A. Refer to Section entitled "General Mechanical Provisions". Provide schedule of colors, lettering, tagging, handling and similar items to clearly identify proposed method of identification for mechanical systems.

1.06 DIMENSIONS

A. Pipe dimensions as used in this section refer to the total outside dimensions (diameters) of both the pipe and its insulation (if any).

PART 2 - PRODUCTS

2.01 GENERAL

A. Comply with ANSI A13. 1-1975, "Scheme for Identification of Piping Systems" and OSHA requirements, or as otherwise indicated.

B. Acceptable Manufacturers: W. H. Brady Co., 2223 West Camden Road, Milwaukee, WI 53201; Seton Name Plate Corporation, 592 Boulevard, New Haven, CT 06505, or equivalent.

2.02 MARKERS, BANDS, TAGS AND LABELS

A. Markers: Must have approved color coded background, proper color of legend in relation to background color, approved legend letter size, approved length and flow arrow indicator.

1. Pipes 3/4" through 5" O.D.: Seton "Setmark" Type SNA marker or equivalent.

2. Pipes 6" O.D. and Greater: Seton "Setmark" Type STR marker or equivalent.

B. Bands: Color coded in minimum widths of 2-1/4" for pipe through 12" O.D. and 4" for pipe 14" O.D. and greater. Brady B-500 Vinyl Cloth, B-350 PermaCode or B-946 Outdoor Film or equivalent as applicable.

C. Valve Tags: Each tag shall designate appropriate service and valve number. Be securely attached with meter seals with 4-ply 0.018 copper smooth wire, or brass "S" hooks, or brass jack chain in a manner to allow easy reading. Provide either of the following types:

1. Brass Type: Minimum 19 gauge polished brass; 1-1/2" min. diameter. Acceptable: Seton Style 250-BL or equivalent.

2. Aluminum Color Coded Type: Anodized aluminum; 2": min. diameter. Acceptable: Seton Style 2070 or equivalent.

3. Aluminum Alloy Type: 16 Gauge sheet aluminum: depressed type letters filled with black enamel. Face and periphery of satin finish Alumilite, Alcoa 204A2 or equal, free from burns and scratches. Seton Type 4 or equivalent.

4. Fiber Glass Type: 1/16" Thick glass fiber reinforced resin. 2"x2" Size of 2-1/2"x9" size as necessary to identify item. Brady Series No. 2297 or equivalent.

D. Labels: Provide either of the following types:

1. Plastic Type: Outdoor grade acrylic plastic to withstand weather, abrasion, grease, acid, chemical and other corrosive conditions; 1/16" min. thickness. Sized 3/4x2-1/2, 1x2-1/2, 1x3 or 1-1/2x4 as necessary to identify item. Seton "Setonite" or equivalent.

2. Aluminum Type: Engraved, flexible, 0.020" thick aluminum. sized 3/4x2-1/2, 1x3, 1-1/2x4 or 3/6 as necessary to identify item. Seton No. 06505 or equivalent.

PART 3 - EXECUTION

3.01 GENERAL

A. Apply only after completion of insulation, painting and cleaning work so that final identification is not disfigured by such other work.

B. Coordinate with actual composition and operating temperatures of surface on which identification is to be placed so that proper permanent adhesion of markers and labels to surface is obtained.

C. Locate marking and banding where practical such that groups of pipe are identified at similar location for ease of visual tracking. For example, mark and band parallel runs of pipe which are side-by-side at the same general place.

D. Small pipes less than 3/4" diameter may be identified with tags similar to those specified for valves.

E. Adhere or affix all identification items permanently except where removal may be necessary for maintenance or service.

3.02 MARKERS AND BANDS

A. Provide on piping as follows:

1. Pipe Concealed in Inaccessible Locations (e.g., Chases, Underground): No identification required.

2. Pipe Concealed in Accessible Locations (e.g., Ceiling Plenums):

   a. Markers every 30 feet of pipe length. Bands every 15 feet of pipe length.

3. Pipe Exposed in Equipment Rooms:
   a. Markers every 15 feet of pipe length for pipe through 12 inches O.D. and every 30 feet for pipe 14 inches O.D. and greater.

4. Bands every 10' of pipe length for pipe through 12" O.D. and every 25' for pipe 14" O.D. and greater.

5. Exterior Pipe, Exposed: No identification required unless otherwise indicated.

3.03 VALVE TAGS

A. Valve tags shall be installed on the following items:

1. All motorized valves (except those valves associated with direct control of flow to air handling apparatus whereby the valve may be identified by reference to the item of equipment it serves).

2. All fire protection system valves located in mains and branches (except those valves in fire hose cabinets).

3. All manual valves which perform functions other than isolation of an equipment item for servicing. This includes, but is not limited to, valves in valve stations, remote locations where use is not evident due to proximity of equipment or other piping, and similar locations.

4. Small piping (other than domestic water) where markers are impractical.

5. Small but critical equipment items on which it is impractical to install labels.

3.04 VALVE TAG LISTS

A. Prior to substantial completion, provide a complete list of all valves having tags. Indicate the following on such list:

1. Valve size.
2. Valve location.
3. Valve type.
4. Service application.
5. Valve manufacturer and model number.
6. Pressure class and allowable working pressure.

3.05 LABELS

A. Provide labels of proper size on mechanical system equipment including but not limited to, pumps, chillers, tanks, major piping components such as air separators, air handling equipment, fans, control panels, terminal units, flow stations, reheat coils and similar items.

3.06 COLORS

A. Colors for piping systems and equipment which are required to be painted shall be as required by architectural specifications.

END OF SECTION 15191

SECTION 15201

VIBRATION ISOLATION EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Provide vibration isolation supports for all equipment and piping as may be required to prevent transmission of vibration to building structure. This shall include air handling units, fans, piping, pumps and similar items.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of the Division 15 and to all other applicable portions of the drawings and specification.

1.04 SHOP DRAWINGS

A. Refer to Section entitled "General Mechanical Provisions". Submittal data shall show type, point loading information, size and deflection of each isolator proposed and any other information as may be required for the Architect/Engineer to check isolator selections for compliance with specifications. Include clearly outlined procedures for installing and adjusting the isolators.

1.05 MANUFACTURERS

A. Products of the following manufacturers will be acceptable, provided they comply with all of the requirements of this specification: Consolidated Kinetics; Mason Industries; Amber-Booth; Keflex; Flexonics; Vibration Eliminator Company or equivalent. Any model numbers listed are from one or more of these manufacturers and are given to provide an example of item(s) required.

1.06 OTHER REQUIREMENTS

A. All vibration isolation equipment shall be both recommended by the manufacturer and approved by the Architect/Engineer for each particular application on this project.

PART 2 - PRODUCTS

2.01 BASIC REQUIREMENTS

A. Unless otherwise noted, spring type vibration isolators shall be used for all motor driven equipment. It shall be the responsibility of isolation manufacturer to determine the amount of spring deflection required for each isolator to achieve optimum performance, prevent the transmission of objectionable vibration and meet noise criteria referenced herein.

2.02 CORROSION PROTECTION

A. Steel components shall be phosphated and painted. All nuts, bolts and washers shall be zinc-electroplated. Structural steel bases shall be thoroughly cleaned of welded slag and primed with zinc-chromate or metal etching primer.

B. All isolators exposed to weather shall have steel parts PVC coated or hot-dip galvanized. Aluminum components shall be etched and painted. Nuts, bolts and washers may be zinc-electroplated.

2.03 BASIC ISOLATORS

A. General: Unit designations indicated are Architect/Engineer designations. Each of the following basic isolators may not be applicable to a specific installation application. See Part 3, "Execution".

B. Spring Mounts, Open Type, Unrestrained (Unit SMOU): Free standing springs; laterally stable; minimum horizontal-to-vertical spring rate (Kx/Ky) of 1.0: 1/2-inch neoprene acoustical friction pads between bottom baseplate and the supporting surface; leveling bolts; provision for bolting the mount to the equipment (unless otherwise specified); spring diameters not less than 0.8 of the compressed height of the spring at rated load; springs shall have a minimum additional travel to full compression of 50% of the rated deflection; 1-inch minimum static deflection (unless otherwise specified); submittals shall include spring diameters, deflections, free spring heights, solid spring heights and operating heights. Be similar to Mason Type SLF; Korfund Series L; Amber-Booth Type SW.

C. Spring Mounts, Open Type, Restrained (Unit SMOR): Free standing springs; laterally stable; 1/2 inch neoprene acoustical friction pads between bottom baseplate and the supporting surface; leveling bolts; provision for bolting the mount to the equipment (unless otherwise specified); spring diameters not less than 0.8 of the compressed height of the spring at rated load; springs shall have a minimum additional travel to full compression of 50% of the rated deflection; 1-inch minimum static deflection (unless otherwise specified); restraint consisting of welded steel channel ends for outdoor installation and welded steel studs for indoor installation; restraint shall have restraining bolts connecting top plate and lower housing to limit vertical rise of isolated equipment when load is reduced; vertical clearance of 1/8 to 3/8 inch shall be maintained between spring top plate and housing (leveling bolts shall be adjusted to maintain this clearance). Submittal shall include spring diameters, deflections, free spring heights, solid spring heights and operating heights. Be similar to Mason Type SLR; Amber-Booth Type CT.

D. Spring Mounts, Housed, Unrestrained (Unit SMHU): Springs free standing within their housing; laterally stable; 1/2 inch neoprene acoustical friction pads between bottom baseplate and the supporting surface; leveling bolts; provision for bolting the mount to the equipment (unless otherwise specified); spring diameters not less than 0.8 of the compressed height of the spring at rated load; springs shall have a minimum additional travel to full compression of 50% of the rated deflection; 1-inch minimum static deflection (unless otherwise specified); welded steel housing; vertical clearance of 1/8 to 3/8 inch shall be maintained between spring top plate and housing (leveling bolts shall be adjusted to maintain this clearance). Submittal shall include spring diameters, deflections, free spring heights, solid spring heights and operating heights. Be similar to Mason Type C.

E. Neoprene and Spring Hangers, Vertical Deflection (Unit NSHV): Steel housing for undampened support of the spring: provisions for attachment of hanger rods; reinforced neoprene washer and grommet to break up metal to metal contact: free standing spring; 1 inch minimum static deflection (unless otherwise specified) spring diameters not less than 0.8 of the compressed height of the spring at rated load; springs shall have a minimum additional travel to full compression of 50% of the rated deflection. Submittals shall include spring diameters, solid spring heights, free spring heights, deflections, overall hanger dimensions and maximum hanger rod diameter which can be accommodated by the hanger. Be similar to Mason Type DNHS: Amber-Booth Type BSR.

F. Neoprene and Spring Hangers, Vertical and Angular Deflection (Unit NSHVA): Shall contain a laterally stable steel spring and 0.3" reflection neoprene or fiberglass element in series. A neoprene neck shall be provided where the hanger rod passes through the steel box supporting the isolator mount to prevent metal to metal contact. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Mason Type 30N.

G. Neoprene and Spring Hangers, Vertical Deflection, Position Type (Unit NSHVP): Steel housing for undampened support of the spring; provisions for attachment of hanger rods; reinforced neoprene washer and grommet to break up metal to metal contact; free standing spring; 1 inch minimum static deflection (unless otherwise specified); spring diameters not less than 0.8 of the compressed height of the spring at rated load; springs shall have a minimum additional travel to full compression of 50% of the rated deflection; be capable of holding the supported item at fixed elevation during installation with secondary adjustment to transfer the load to the spring while maintaining a fixed position; scale and pointer to indicate the deflection. Submittals shall include spring diameters, solid spring heights, free spring heights, deflections, overall hanger dimensions and maximum hanger rod diameter which can be accommodated by the hanger. Be similar to Mason Type PCDNHS: Amber-Booth Type PBS.

H. Neoprene and Spring Hangers, Vertical and Angular Deflection, Position Type (Unit NSHVAP): Shall contain a laterally stable steel spring and 0.3" deflection neoprene or fiberglass element in series. A neoprene neck shall be provided where the hanger rod passes through the steel box supporting the isolator mount to prevent metal to metal contact. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Be capable of holding the supported item at the fixed elevation during installation with secondary adjustment to transfer the load to the spring while maintaining a fixed position; scale and pointer to indicate the deflection; similar to Mason Type PC30N.

I. Neoprene-In-Shear Hangers (Unit NH): Steel housing for undampened support of the neoprene; provisions for attachment of hanger rods; neoprene-in-shear isolator; similar to Mason Type HD, Amber-Booth Type HRD.

J. Neoprene-In-Shear Mounts (Unit NM): Double deflection neoprene-in-shear mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene-covered. The top and bottom surfaces shall be neoprene ribbed and bolt holes shall be provided in the base. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mountings to compensate for the overhang; steel rails shall be by same manufacturer as vibration isolators and equivalent to Mason Industries Type DNR. Mounts shall be Mason

Industries Type ND, Consolidated Kinetics Type RD or Vibration Mounts and Controls Series RD.

K. Flexible Pipe Connectors: Same internal diameter as the pipe in which the connector is installed (not necessarily internal diameters of inlets or outlets of equipment).

1. Both recommended by the manufacturer and approved by the Architect/Engineer to be suitable for handling the conveyed fluid at all conditions (maximums and minimums of temperatures, pressures, velocities, etc.) encountered for each particular application.

2. Of proper design to absorb the combination of vibratory and/or expansion or contraction motions (lateral and/or axial and/or angular) encountered at each installation point (for example, do not use hose type where axial motion is encountered at the installation point unless so recommended by the manufacturer and approved by the Architect.

3. Neoprene double sphere (Unit SSB): Heavy duty neoprene double sphere, steel flanges; lateral and angular movement; rated to withstand 180°F operating temperature and 150 psig working pressure. Mason no. MFTNC or equivelent.

L. Acoustic Seals (Unit AS): Consist of an S-shaped molded synthetic rubber seal attached with stainless steel clamps to the pipe wall sleeves and to carrier piping. Wall sleeves shall be two pipe sizes larger than the carrier pipe and/or its insulation. Amber-Booth Type 301.

M. Inertia Bases (Unit IB):

1. Weigh at least 1.5 times the weight of the particular machine being supported.

2. Rectangular welded structural channel steel perimeter frame.

3. Reinforced concrete.

4. Height saving support brackets.

5. Width and length at least 6 inches beyond machine's overall width and length (if necessary, larger for pumps as required to support suction and discharge wells).

6. Structural steel channel depth and concrete base depth shall be a minimum of 1/15th of the longest base dimension but not less than 6 inches.

7. Forms shall include 1/2 inch (or larger if necessary) steel reinforcing bars welded in place on 6 inch centers running both ways across the width and length in a layer 1-1/2 inches above the bottom of the base. Drilled steel members with sleeves welded below the holes to receive equipment anchor bolts.

8. Similar to Mason Type KSL Base.

N. Steel Equipment Frames (Unit SEF): Frames shall consist of structural steel sections sized, spaced and connected to form a rigid base which will not twist, rack, deform or deflect in any manner that will negatively affect the operation of the supported equipment or the performance of the vibration isolation mounts. Frames shall be of adequate size and plan form to support basic equipment units and motors plus any associated pipe elbow or duct elbow supports and electrical control elements or other components closely related and requiring resilient support in

order to prevent vibration transfer from equipment to the building structure. Frames shall include side mounting brackets for attachment to Unit SMOU isolator or other specified isolator. The clearance between the underside of any frame or mounted equipment unit and the top of the building structure below shall be at least 2 inches.

O. Neoprene Pads (Unit NP): Waffle or ribbed pattern neoprene pads shall be fabricated from 40-50 Durometer neoprene. Mason Type W.

P. Isolation rails, curb mounted, for roof mounted air handling units (Unit IRCM): Curb mounted roof top units shall each be isolated with a continuous roof top isolation assembly consisting of extruded aluminum rails formed to fit curb and equipment with a flexible air and weather seal continuously joining the two rails and incorporating spring isolators sized for 1" static deflection. Flexible weather seals shall be 1/16th inch thick minimum reinforced Neoprene protected from direct sunlight and accidental puncture by an extruded aluminum shield and shall be capable of being replaced completely without disturbing the unit mounting. Springs shall be stable with a KX/KY (horizontal to vertical spring rate) of 1.0 or greater and be properly sized to support the load at 1" static deflection. Isolation assembly shall have Neoprene cushioned wind restraints which are not engaged in normal operation with sufficient capacity to resist wind load in any direction without distortion or damage to the isolated equipment. Entire assemblies shall be shipped in one piece to eliminate field joint and possible leakage. Mason Industries CMAB.

PART 3 - EXECUTION

3.01 GENERAL

A. All isolators shall be installed in strict accordance with the manufacturer's instructions and shall be properly adjusted prior to requesting final inspection or the performance of any vibration testing specified.

B. Each item of equipment (machinery, piping, etc.) which is provided with vibration isolation equipment shall rest in its intended, proper operating position (i.e; exactly level, etc.) after installation of vibration isolation equipment. Approval of such vibration isolation equipment by Architect/Engineer shall not relieve the Contractor of this responsibility.

C. Equipment which is specified to rest on concrete housekeeping pads shall have Unit NP pads unless otherwise indicated.

3.02 AIR HANDLING UNITS AND CONDENSING UNITS

A. Floor Mounted:

1. Neoprene Pads (Unit NP).

2. Mount condensing units on aluminum frames as specified in other sections.

B. Suspended from Building Structure:

1. Spring hangers (Unit NSHV) with 1-inch minimum static deflection.

3.03 FANS, IN-LINE CENTRIFUGAL LIGHT DUTY AND HEAVY DUTY

A. Flexible duct connectors as specified in "Ductwork".

B. Neoprene-in-shear hangers (Unit NH).

3.04 MANUFACTURER'S SUPERVISION

B. The Contractor shall include in his price the cost of the vibration isolation manufacturer or his qualified representative for providing such supervision as may be necessary to assure correct installation and adjustment of the isolators. Upon completion of the installation and after system is put into operation, the manufacturer or his representative shall make a final inspection and submit his report to the Architect/Engineer in writing certifying the correctness of installation and compliance with approved submittal data.

END OF SECTION 15201

SECTION 15251

INSULATION, HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Provide all work necessary to insulate all equipment, piping, ducts and other items related to the piping and duct systems.

1.03 RELATION TO OTHER WORK

A. Refer to the section, General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

B. This section directly relates in particular to sections (which may or may not be included in this division) which describe the following:

1. Piping systems.
2. Duct systems.

C. Other items which contain or convey fluids which are at such temperatures as to create condensation or surface temperatures which are hazardous or where heat loss or gain prohibits proper system operation.

1.04 SHOP DRAWINGS

A. General: Refer to the Section entitled "General Mechanical Provisions". Shop drawings shall contain complete descriptive and engineering data, including flame spread and smoke developed ratings (ASTM E84 test method) on all materials and adhesives. Where finishes, covers, or jackets are specified, provide complete data on same. Shop drawings shall contain specified information on: densities, conductivities, conductances, or resistances as required to establish conformance with the specified values or materials.

B. Industry Standards: Where compliance with an industry, society or association standard is specified or indicated, certification of such compliance shall be submitted with shop drawings.

C. Commencement of Work: Submit shop drawings before any work is commenced.

1.05 STORAGE OF MATERIALS

A. Do not store fiberglass insulation within the building until it has been "dried in". If no other dry space is available and this insulation must be installed or stored before the building is "dried in" and completely enclosed, provide polyethylene film cover for protection.

1.06 COMPLIANCE WITH CODES AND STANDARDS

A. Applicable Codes: The total insulation system including insulation, sealant, finishes, etc., shall comply with or exceed all code requirements.

B. NFPA: All materials and adhesives used shall conform to the requirements of NFPA 90A as to flame spread and smoke developed ratings.

1.07 DEFINITIONS AND TERMINOLOGY

A. Terminology: Throughout this section, insulation products may be described as regards the location, surface or other point at which they are to be applied. Except in special cases (where a detailed indication or description will be given), the majority of conditions can be defined in whole or in part by use of (but not necessarily limited to) any or all of the following words:

1. "Internal" or "external".
2. "Interior" or "exterior".
3. "Concealed" or "exposed".
4. "Protected" or "Unprotected".

B. Definitions: Wordage used to describe locations, surfaces or other points or conditions shall be defined as follows as related to this section. Where the ascertainment or determination of locations, surfaces and other conditions is obvious from the intent of use of the item (e.g., roof-mounted ductwork, underground piping, etc.) or from other information, then the following words may not be required. If any ambiguity should occur, provide bid based on the most severe condition; however, obtain clarification from Architect/Engineer prior to installation:

1. "Internal" and "external": Relates to an item or its surface which is to be insulated or uninsulated. Does not relate to the confines of the building, structure or other entity in which the item is located. (Examples: internal/external surfaces of ductwork, pipe, air handling units or other such items.)

2. "Interior": Relates to the location of an item as to whether the item is within a heated, ventilated, air conditioned or otherwise controlled environment of the building, structure or other entity in which the item is located. "Interior" is always "protected". (Examples(s): interior ductwork, interior piping, interior air handling units.)

3. "Exterior": Relates to the location of an item as to whether the item is outside (i.e., exterior to) a heated, ventilated, air conditioned or otherwise controlled environment of the building, structure, facility or other entity which the item serves or relates. "Exterior" generally means that the item is surrounded by the ambient outside environment. "Exterior" is considered "unprotected" unless otherwise described. (Examples(s): exterior rooftop air handling units, exterior ductwork, exterior cooling tower.)

4. "Concealed" and "exposed": Relates to the visibility of an item. "Concealed" implies out-of-sight from normal view by an occupant, user or employee of the facility when such person is performing their normal function. "Exposed" implies that the item is readily visible by such a person when that person is performing a normal function. (Examples(s): "concealed interior ductwork" would be out-of-sight in a ceiling plenum, whereas "exposed interior ductwork" would be readily visible in a mechanical equipment room or in a room which intentionally had no ceiling system.)

5. "Protected" and "unprotected": Relates to an exterior item which may or may not be sheltered from the outside elements but which exists in contiguous contact with the ambient environment without benefit of any direct heating, ventilating or air conditioning. (Example(s): Piping or ducts located in an open crawl space beneath a building would be "protected/concealed"; in an open parking garage such piping or ducts would be "protected/exposed". Piping or ducts on a rooftop would be "unprotected" and usually "exposed".)

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials: Materials listed are those used as basis of design; equivalent products of acceptable manufacturers will be accepted. Materials must be approved and recommended by the insulation product manufacturer for the particular application(s).

B. Flame and Smoke Ratings: Application of insulation materials may require, in many cases, that the final insulation system comply with NFPA 90A with regard to maintaining a flame spread rating of 25 or less and a smoke developed/fuel contributed valve of 50 or less. In such cases, verify that the materials comply with the indicated flame spread and smoke developed ratings.

C. Applicability: Products and manufacturers listed may not all be applicable. Use only those products and manufacturers which are indicated as being applicable to a specific insulation condition.

D. Acceptable Manufacturers: Manufacturers which are listed are those manufacturers who may make one or more of the insulation products required. Listing of a manufacturer does not necessarily mean the manufacturer is approved for all applicable insulation conditions. Each listed manufacturer must still comply with the specific requirements of each insulation condition to be acceptable for the particular application. Acceptable manufacturers of insulation-related products include (but are not necessarily limited to) the following: Armstrong; CertainTeed; Childers Products Co.; Knauf; Manville; Owens-Corning; Pittsburg Corning; Rubatex; Upjohn Co.; Duracote Corporation; Ferro Corporation; Dow Corning Corporation; Duro Dyne Corporation; Goodloe E. Moore, Inc.; 3M Co.; United McGill Corporation, Vimasco Corporation; Foster; Gustin-Bacon; Nomaco Inc.; Insulcoustic; Molded Acoustical Products; Lion Nokorode and other manufacturers as may be listed for a specific application.

2.02 BASIC MATERIALS

A. Elastomeric Insulation: Preformed (tube), roll or sheet as indicated or as applicable. Nitrile, rubber based, closed cell structure. K factor of 0.28 at 75°F. In tube, roll or sheet form of 3/4-inch thickness or less, ASTM E 84 flame spread rating of "25" or less and smoke developed rating of "50" or less. Recommended temperature applications from -40°F to 220°F when installed in accord with manufacturer's recommendations. Do not install in return air plenums unless flame spread rating and smoke developed rating are within constraints of applicable codes. Manufacturers and/or series: Armstrong "Armaflex"; Manville "Aerotube"; "Rubatex"; Gustin-Bacon "Ultra-Foam".

B. Fiberglass Insulation: Inorganic fibrous glass. Flame spread of "25" or less and smoke developed rating of "50" or less per ASTM E 84.

1. Board: Rigid or semi-rigid form, faced or unfaced as indicated. Stiffness of 475 EI, 800 EI or 1400 EI as indicated.

2. Blanket: Flexible form; faced, unfaced or coated as indicated.

2.03 INSULATION PRODUCTS, BASIC

A. Type PI-5: Pipe insulation, preformed elastomeric. Rubatex, Armaflex II or equivalent.

B. Type I-3: Elastomeric insulation. Field formed, fitted and finished as required for the application. Armaflex, Rubatex or equivalent.

C. Type DI-1: Duct insulation, fiberglass flexible blanket wrap. Composed of flexible blanket of glass fiber factory laminated to a reinforced foil kraft (FRK) vapor barrier with a minimum 2-inch taping and stapling flange on one edge. Suitable for operation at temperatures from 40°F to 250°F. Thermal conductivity of 0.31 at 75°F. Minimum density of three-quarter (3/4) pound per cubic foot. Provide in thickness of two (2) inches unless otherwise specified as 2-1/2 or 3-inch thickness. Owens-Corning All Service Faced Duct Wrap; Manville R-Series Microlite; CertainTeed Standard Duct Wrap; or equivalent.

D. Type DI-2: Duct insulation, fiberglass semi-rigid board. Composed of resin bonded glass fibers faced with a foil scrim-kraft (FSK) reinforced laminate of aluminum foil and kraft bonded to provide a metallic surface finish vapor barrier; alternate vapor barrier facing (if specifically indicated) is an all service jacket (ASJ) of high intensity white bleached, chemically treated kraft paper reinforced with fiberglass yarn mesh and laminated to aluminum foil with fire-retardant adhesive to impart a clean, white appearance. Conductivity (K) of not greater than 0.23 at 75°F. Provide in thickness of one (1) inch unless otherwise indicated. Provide with minimum density of 3-pcf unless 6-pcf is specifically indicated. CertainTeed Industrial Insulation Board Type IB-300 (or IB-600); Manville 800 Series Spin-Glas Type 814 (or 817); Owens-Corning 700 Series Industrial Insulation Board Type 703 (or Type 705); or equivalent.

2.04 INSULATION ADHESIVES, MASTICS, SEALANTS

A. Adhesive (Type A-E1): For joints and seams in elastomeric insulation (Type I-3) not requiring weather protection. Rubatex R-373 Insulation Adhesive; Armstrong 520 Adhesive or equivalent.

B. Adhesive (Type A-F1): For adhering fiberglass blanket and board insulations (Types DI-1, DI-2) to metal substrate such as ductwork. Insulcoustic I-C 201, Foster 85-20 or equivalent.

C. Mastic, General Purpose (Type M-GP1): Non hardening vapor barrier general purpose mastic. For use where indicated or otherwise applicable. Foster GPM 35-00 or equivalent.

2.05 INSULATION FINISHES, JACKETS AND COVERS

A. Finishing Coating (Type FC-E1): For weather protection of elastomeric insulations (Types I-3, PI-5). Rubatex 374 coating; Armstrong Armaflex Finish or equivalent.

B. Finish Fabric, General Purpose (Type FF-GP1): Nylon membrane. For use generally with fiberglass duct insulations (Types DI-1, DI-2) at joints or seams or as may be indicated. Apply using Foster GPM 35-00 or equivalent.

2.06 RELATED PRODUCTS

A. Straps (Type ST-1): Stainless steel T-304 (18-8) soft annealed with deburred edge with stainless steel wing seals. Childers Products "Febstraps" or equivalent.

B. Tape (Type T-1): High tensile strength rope stock flat back paper pressure sensitive tape. Pittsburg-Corning "PC Tape No. 25" or equivalent.

C. Screws (Type S-1): Aluminum pan head type "A" slotted #8 by 1/2-inch.

PART 3 - EXECUTION

3.01 GENERAL

A. Field Forming, Fitting and Finishing: Where preformed insulation products are indicated as being acceptable for a particular application, provide field formed, fitted and finished insulation systems if such application is more practical (such as due to size, configuration or dimensions which may be outside of the availability ranges for size, dimension and/or thickness of preformed products).

B. Pre-installation:

1. Do not apply insulation adhesives, materials or finishes until the item to be insulated has been completely installed and tested and proved tight and suitable for insulation.

2. Prepare surfaces to be clean and dry before attempting to apply insulation.

C. Insulation Shields: Provide hanger or pipe support shields of 16 gage (minimum) galvanized steel over or embedded in the insulation. Shield shall extend halfway up the pipe insulation cover and at least 6" on each side of the hanger. Securely fasten shield with pipe straps at each end.

D. Valves, Cocks and Specialties: Insulate as for the related piping system in which they are located unless otherwise indicated.

E. Factory Pre-insulated Components: Where equipment and other system components are specified in other sections to have factory installed insulation, then no additional insulation is required as work of this section unless additional non-factory-installed insulation is specifically described. Examples of such equipment and components which may not require additional insulation include, but are not necessarily limited to, boiler vessels, chiller evaporators, air handling units, airside terminal units, and similar items.

F. Minimum Thicknesses: Insulation thicknesses which are indicated are minimum thicknesses. Contractor may provide the same insulation material in greater thickness as an aid to installation and handling procedures or due to material availability and procurement considerations.

3.02 INSULATION THICKNESS FOR PIPING SYSTEMS

A. General:

1. Basis: Insulation thicknesses for piping are given for insulation installed in the locations indicated. Thicknesses are based on the various conditions of temperature, usage and environment which are typically encountered.

2. Applicable Thicknesses: All thicknesses as applicable to all conditions may not be given in this section article. Where an insulation thickness for a particular application is specified to be of other thickness than may be listed in this section article, "INSULATION THICKNESSES FOR PIPING SYSTEMS", then provide the insulation in the thickness indicated in other portion of this section which specifically describes the particular insulation application and its required insulation thickness. Thicknesses for other than piping insulation are given in the specific description of the particular application or description of the particular material used.

3. Ambient Conditions: Unless otherwise indicated, ambient conditions for the purpose of describing insulation thicknesses are related to cold applications to prevent condensation or excessive heat gain (e.g., chilled water pipe, cold vessels) and are related to hot applications to prevent harm to personnel or to prevent objectionable heat loss to the environment (e.g, hot water pipe, hot vessels, hot stacks).

   a. These conditions are generally:

      Interior: 80°F and 80% RH.
      Exterior: 90°F and 80% RH.

4. Thickness Requirements: Thicknesses given in the sections below are based on the following information:

   a. General type of fluid or process involved (e.g., chilled water, hot water, steam, refrigerant).

   b. General location and, if necessary, conditions related to temperature (either or both internal or external to the insulation barrier) and ambient environment of the insulated item.

   c. Pipe size range.

3.03 DUCT SYSTEMS

A. Internal Insulation: See section entitled "Ductwork". The section entitled "Ductwork" describes all of the ductwork used on this project, and defines whether the ductwork should be insulated internally as work of the "Ductwork" section or externally as work of the "Insulation, HVAC" section.

B. External Insulation: Ductwork which is required to be insulated externally shall be insulated as work of this section.

C. Factory Insulation: Ductwork which is factory manufactured with internal or external insulation is not to be additionally insulated as work of this section unless specifically stated. Such factory insulated ductwork generally consists of flexible externally insulated ductwork and double walled acoustically thermally lined ductwork.

D. Interior, Concealed (e.g., ceiling plenums): Where external insulation is required, insulate externally with 2-inch thick fiberglass blanket wrap (Type DI-1). Adhere duct insulation using adhesive (Type A-F1) applied in accordance with the manufacturer's recommendations. Where duct width exceeds twenty-four inches (24"), the insulation shall be additionally secured to the

bottom of the duct using mechanical fasteners spaced one foot (1') on center. Insulation shall be applied with edges tightly butted, and all joints and breaks in the vapor barrier sealed using glass fabric and mastic applied in conformance with manufacturer's recommendations.

E. Interior, Exposed, (e.g., air handling unit rooms): Insulate with 1-inch thick semi-rigid fiberglass board (Type DI-2). Adhere to ductwork with adhesive (Type A-F1). Finish joints and seams with finish fabric (Type FF-GP1).

3.04 DUCT SYSTEMS EQUIPMENT

A. General: Insulate as follows unless detailed to a greater extent on the Drawings.

B. Fire damper and Fire/Smoke Damper External Surfaces:

1. Externally Insulated Duct Locations: Extend duct insulation up face of fire damper to damper sleeve. Seal insulation edges with 4-inch minimum width duct tape.

2. Internally Insulated Duct Locations: Provide additional external insulation from a point on the duct 12 inches from the fire damper to the fire damper and on the face of the fire damper to the fire damper sleeve. Seal insulation edges with 4-inch minimum width duct tape.

C. Air Distribution Devices: Insulate the backs of all ceiling diffusers and other air outlet devices installed in other than return air plenums as specified for interior concealed ducts.

3.05 COLD EQUIPMENT AND RELATED COMPONENTS

A. Condensate Drain Piping From Cooling Equipment:

1. Interior, and Exterior, Protected: Insulate with preformed elastomeric pipe insulation (Type PI-5) secured with adhesive (Type A-E1) and finished with white finish coating (FCC-E1). Thickness 3/4-inch. Provide 25/50 flame/smoke rating.

2. Exterior, Unprotected: None applicable.

3. Where Schedule 80 pvc is used, insulation is not required. Pvc may not be installed in air plenums.

B. Refrigerant Piping:

1. All refrigerant piping (hot gas) shall be insulated with preformed elastomeric pipe insulation (type PI-5) secured with adhesive (type A-E1) and finished with white finish coating (FCC-E1). Thickness 3/4-inch (interior), 1"(exterior). Provide 25/50 flame/smoke rating.

END OF SECTION 15251

Intentionally Left Blank

SECTION 15300

FIRE PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Basic Requirements: Provisions of Section 15010, BASIC MECHANICAL REQUIREMENTS, and Section 15030, ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT, are a part of this Section.

1.02 SUMMARY

A. General: Provide the fire protection systems indicated on the drawings and within this specification section.

1.03 ADDITIONAL REQUIREMENTS

A. Related Sections: Other Sections of Division 15 which relate to the requirements of this Section may include but are not limited to the following:

1. 15050, BASIC MECHANICAL MATERIALS AND METHODS
2. 15250, THERMAL INSULATION

1.04 SUBMITTAL

A. General: Refer to paragraph entitled "SUBMITTAL" in Section 15010. Include the following data:

B. Manufacturers Literature: Dimensional outline drawing, product data, and verification of UL/FM approval for all fire protection equipment, piping, fittings, and products.

C. Piping Shop Drawings: Submit 1/8" scale piping shop drawings as prescribed in Section 15010 and as required by codes. Shop drawings shall include sprinkler piping cut lengths, offsets, fittings and devices, elevations, hanger locations, sprinkler head count by type, elevation sections and other installation information.

D. Submit hydraulic calculations proving the viability of the most hydraulically remote areas of the project. Indicate hydraulic reference points and submit computer analyzed nodal calculations in both tabular and graphical formats. Hydraulic imbalance shall not exceed 0.01 gpm at any node, and water velocity shall not exceed 20 feet per second. Demonstrate compliance with the requirements of NFPA-13 regarding density, area of application, selection of hydraulically remote areas, and maximum coverage per sprinkler.

1.05 APPLICABLE STANDARDS

A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the paragraph entitled "Code Compliance" in Section 15010.

B. Revised editions of the NFPA National Fire Codes (NFPA) as indicated in Section 15010:

C. Editions of the NFPA National Fire Codes (NFPA), or the latest Revisions of these Codes as adopted by the authority having lawful jurisdiction, as follows:

1. NFPA - Fire Sprinkler System: The fire sprinkler protection systems installation, flushing and testing shall comply with the requirements of NFPA 13, and 24.

2. NFPA - Standpipe and Hose System: Standpipe system shall comply with the requirements of NFPA 14.

3. NFPA - Portable Fire Extinguisher: Portable fire extinguishers shall comply with the requirements of NFPA 10.

4. NFPA – Residential sprinkler systems: Residential sprinkler systems shall comply with NFPA 13R requirements.

D. Pipe Thread Pattern: All threads shall be in accordance with local fire department specifications and NFPA 1963.

E. UL/FM Approval: All equipment, piping, fittings, valves, couplings, hangers and devices shall be approved by Underwriters' Laboratory (UL) and Factory Mutual (FM) for use in fire protection service.

F. Licensure: The fire protection systems shall be installed by a State of Florida Licensed Fire Protection Contractor.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. General: Refer to paragraph entitled "MANUFACTURERS" in Section 15010.

B. Single Manufacturer: All items of a similar type shall be by the same manufacturer.

2.02 SPRINKLER HEADS

A. Provide the following sprinkler heads of proper types, ratings, and spacings for the areas involved. Provide appropriate finishes compatible with space finishes being served. Acceptable manufacturers: Viking, Grinnell, Automatic Sprinkler, Central, Star, and Reliable.

B. Pendent heads in ceilings and horizontal sidewall heads shall have one-piece, nonadjustable escutcheons. Two-piece or slip type escutcheons shall not be accepted. This does not apply to semi-recessed heads.

C. Spare Fire Sprinkler Head Cabinet: Provide sufficient spare sprinkler head cabinets to store the required quantities of sprinkler heads. Storage cabinets shall be red gloss, polyester-coated steel construction. Provide a minimum of six spare heads of each type and each different temperature rating installed; provide 2 installation tools or wrenches with each different type of sprinkler head. Cabinet shall have catch-lock and continuous piano hinge. Locate the spare sprinkler head cabinet as directed by the Owner's Representative.

D. Sprinkler Cage Guard: Provide sprinkler head open-wire cage guard to protect the sprinkler heads. Cage wire shall be cadmium-plated steel. Install cage guard in mechanical rooms and electrical rooms.

2.03 PIPE AND FITTINGS

A. Underground Pipe and Fittings:

1. Provide cement lined ductile iron pipe, Class 52 conforming to ANSI/AWWA C151/A21.51 for Tyton joint pipe or ANSI/AWWA C111/A21.11 for mechanical joint pipe. Acceptable Manufacturers: U.S. Pipe, American Pipe, McWane, or equivalent.

2. Fittings shall be push-on joint ductile iron fittings, 350 PSI, with field loc gaskets, or mechanical joint ductile iron fittings conforming to ANSI/AWWA C110/A21.10 and C111/A21.11.

3. Provide concrete thrust blocks at all fittings, valves, and changes in direction.

4. Provide braces, bridle rods, or restraining systems typical of "MEGALUG" by EBBA, Inc., on all mechanical joint fittings and valves.

5. All exterior site piping shall be buried with a standard, permanent, bright colored, continuous printed plastic tape. Tape shall be intended for direct burial service and buried directly above the service line. The tape shall be 6 inches by 4 mils thick minimum. Tape shall be printed with proper identification of the service located below it.

B. Above Ground Pipe and Fittings:

1. Piping shall be Schedule 40 black steel pipe conforming to ASTM A135 or ASTM A53, and Schedule 10, ASTM A135.

2. Threadable thinwall black steel pipe conforming to ASTM A135, or ASTM 795, with a corrosion resistance rating (CRR) of 1.0 or greater as manufactured by American Tube Company, Dyna-Thread-40 or equivalent.

3. Fittings:

a. Cast iron threaded fittings, ANSI B16.4 Class 125.
b. Cast iron flanged fittings, ANSI B16.1 Class 125.
c. Mechanical joint, grooved couplings, as manufactured by Victaulic, Sprink, Gruvlok, or Central. All groove couplings and fittings shall be furnished by a single manufacturer.
d. System pressures exceeding 175 PSI shall have cast iron threaded fittings and flanged fittings, Class 250 rated for a minimum 400 PSI. Grooved couplings and fittings shall have a minimum rating of 300 PSI.

4. Piping for drainage systems shall be Schedule 40 galvanized steel pipe, ASTM A795 or A135 with galvanized threaded fittings, ANSI B16.4, galvanized coated, both interior and exterior of pipe and fittings.

5. Piping and fittings for residential sprinkler systems (NFPA-13R) shall be schedule 40 and 80 CPVC sprinkler pipe conforming to ASTM F442. Fittings shall conform to ASTM F438 and F439. Solvent cement shall be supplied by the pipe manufacturer, no exception. Piping and fittings shall be U.L. and F.M. approved.

C. Hangers, Supports, and Sleeves:

1. Support piping with UL and FM approved hangers. Acceptable manufacturers: Grinnell, B-Line, Fee & Mason, Michigan and PHd.

2. All hangers and rods in garage shall be stainless steel.

3. Adjustable Clevis: Grinnell Fig. 260.

4. Adjustable Swivel: Grinnell Fig. 69.

5. Beam Clamp: Grinnell Fig. 92 and Grinnell Fig. 218.

6. Concrete Fasteners: Grinnell steel shell and expander plug.

7. Concrete Insert: Grinnell Fig. 152.

8. Riser Clamp: Grinnell Fig. 261.

9. Powder-driven inserts shall not be accepted.

10. All pipes passing through rated floors or walls shall be sleeved and firestopped to an equivalent rating of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements.

2.04 VALVES

A. Acceptable Valve Manufacturers: Stockham, Nibco, Grinnell, Mueller, Kennedy, Crane, and Central.

B. Outside system valves:

1. Detector double check valves assembly: Hersey Model DDC-II with 2" bronze by-pass meter or local water department standard. Size as indicated on drawings.

a. Acceptable Manufacturers: Hersey, Watts, Wilkens, Febco, and Ames.

2. Insulated Enclosures for Backflow Preventers: Enclosure shall be constructed of aluminum and insulated completely with non-wicking insulation. The enclosure shall contain a thermostatic controlled heater to maintain temperatures above 40°F. Side panels shall contain access doors for testing and drain openings. The enclosure shall be installed and anchored on a 6" thick concrete pad.

a. Acceptable Manufacturers: Hot Box, HydroCowl, or equivalent.

3. Cutoff valves in valve pit: Stockham G-610 flanged pattern outside screw and yoke wedge gate valves, epoxy coated.

4. Underground sectional control valves: Stockham G-605 flanged, or G-606 mechanical joint, or G-607 Tyton joint, NRS gate valve, epoxy coated. Provide cast iron roadway box, extended to grade.

5. Post indicator valves: Stockham G-600 flanged or G-601 mechanical joint, or G-603 Tyton joint, NRS gate valve, epoxy coated. Stockham G-951A indicator post with required extension sleeve. Install indicator post with window 30" above finished grade.

C. Interior Valves:

1. Check valves:

   a. Iron body, Stockham G-939 swing check valve, flanged body.
   b. Bronze body, Nibco KT-403-W threaded check valve with dielectric unions.
   c. Grooved iron body, Central Check valve-90.
   d. Wafer check, GEM F512 wafer check valve.

2. Gate valves:

   a. Iron body, O.S.&Y. gate valves, Stockham G-634, flanged and G-633 threaded.
   b. Bronze body, O.S.&Y. gate valve, Nibco T-104-0, threaded with dielectric unions.

3. Butterfly valves:

   a. Grooved, Nibco GD-4765-8N (with integral tamper switch), 2 ½" through 12".
   b. Grooved, Milwaukee Butterball (with intergral tamper switch),1" through 2 ½".

4. Gate valves:

   a. Iron body, O.S.&Y. gate valve, 300 WWP, Stockham F-670.

D. Wall Indicator:

1. Gate valve, Stockham G-632, flanged NRS.

2. Wall indicator post, Stockham G-950.

E. Hose valves:

1. Acceptable manufacturers are Potter-Roemer, Elkhart, Guardian and Croker.

2. Angle Hose Valve: Angle hose valves shall have 2-1/2 inch female x 2-1/2 inch male threaded connections. Provide 2-1/2" x 1-1/2 inch reducer and cap.

   a. Potter-Roemer 4065 with Fig. 2810 and 4615.

3. Straight Pattern Hose Gate Valve: Gate hose valves shall have 2-1/2 inch female x 2-1/2 inch male threaded connections.

   a. Potter-Roemer 4315 with Fig. 4625.

4. Pressure Reducing Hose Valve: 2-1/2 inch fire hose valves shall have iron body, and 2-1/2 x 1-1/2 inch reducer, cap and chain.

   a. Potter-Roemer 4053 with Fig. 2810 and 4615.

2.05 FIRE DEPARTMENT CONNECTION

A. Flush Mounted Inlet Connection: Provide polished chrome-plated flush cast brass inlet connection. Provide polished rectangular chrome-plated backplate with embossed letters describing the associated fire protection system, such as, "AUTO. SPKR. STANDPIPE".

1. Potter-Roemer 5023-D-F dual inlet, 4" supply.
2. Potter-Roemer 5033-D-F three way inlet, 6" supply.

B. Exposed Inlet Connection: Provide polished chrome-plated exposed cast brass inlet connection. Polished round chrome-plated backplate with embossed letters describing the associated fire protection system, such as, "AUTO. SPKR. STANDPIPE".

1. Potter-Roemer 5751-D-F Series (Dual-Inlet).

C. Sidewalk Siamese: Provide chrome-plated free standing cast brass inlet connection. Provide polished chrome-plated 18-inch standpipe sleeve with sidewalk plate with embossed letters describing the associated fire protection system, such as, "AUTO. SPKR. STANDPIPE".

1. Potter-Roemer 5761-C Series, two way inlet, 4" supply.
2. Potter-Roemer 5776-C Series, four way inlet, 6" supply.

D. Roof Connection: Roof manifolds shall be polished chrome, cast brass hydrant with control valve.

1. Freestanding: Potter-Roemer 5845-D with 5855-D control valve.
2. Wall mounted: Potter-Roemer 5840-D with 5850-D control valve.

2.06 WATERFLOW DEVICES AND SUPERVISORY SWITCHES

A. Acceptable manufacturers: Potter Electric Signal Co., Potter-Roemer, Simplex, GEM

A. Isolation Valve Tamper Switch: Provide an electronic supervisory tamper switch on each isolation valve in the sprinkler system. Unit shall have a red tamper-proof cover, which will activate an alarm or trouble signal when adjusted. Provide unit with single-pole, double throw switches, and mounting bracket.

1. Potter Electric Signal Co. OSYSU-1

B. Post Indicator Valve Tamper Switch: Provide weatherproof electronic supervisory or tamper switch on each indicator post valve in the fire protection system. Unit shall have a red tamper-proof cover, which will activate an alarm or trouble signal when adjusted. Provide unit with single-pole, double throw switch, and mounting bracket.

1. Potter Electric Signal Co. PCVS-1

C. Flow Switch: Provide an electric flow switch where indicated or required. Flow shall be sensed by an immersion paddle, with an adjustable retard setting from 0 to 70 seconds to minimize false alarms. Flow switch shall havesingle pole, double throw switches to activate a flow alarm, or to indicate a trouble signal if the flow switch housing is tampered. Flow alarm shall be automatically resetting. Provide clamp-on housing to secure unit to pipe, or threaded connection for tee fitting.

1. Potter Electric Signal Co. VSR-F

D. Sight Drain: Sight drain shall have 2 view windows to provide visual observation of water flow, and shall have female threaded connections.

1. Manufacturer and Model Number:

a. Potter-Roemer 6171/6172/6173/6174

E. Inspector's Test and Drain: Test and drain shall be provided with integral sight glass, integral 1/2 inch test orifice and positive positioning of handle for off, test and drain operations.

1. Manufacturer and Model Number:

a. G/J Innovations, Inc "Sure-Test"
b. AGF Manufacturing, Inc.
c. "Testdrain"

F. Electric Alarm Bell: 10 inch electric bell 120 VAC.

1. Manufacturer and Model Number:

a. Notifier N-CO-BELL

2.07 FIRE HOSE AND EXTINGUISHER CABINETS

A. General: Provide fire hose and extinguisher cabinets with devices as indicated. All devices, except for the portable fire extinguisher, shall be of the same manufacturer.

B. Cabinet: Fire hose and extinguisher cabinet shall be minimum 20-gauge steel, 18 gauge steel frame with gloss white finish. Cabinet shall have clear breakable full glass vision panel, handle, camlock, and continuous piano hinge.

1. Manufacturer and Model Number:

a. Potter-Roemer 1414
b. Larsen HC3238R

C. Fire Hose Valve: 2-1/2 inch fire hose valve as specified herein.

D. Nipple: 2-1/2 inch brass hexagon nipple.

1. Manufacturer and Model Number:

a. Potter-Roemer 2756
b. Elkhart 46-S

E. Reducer: 2-1/2 x 1-1/2 inch brass reducer, threaded couplings as specified herein.

1. Manufacturer and Model Number:

a. Potter-Roemer 2810

F. Hose Rack: 2-1/2 x 1-1/2 inch hose rack designed to retain the water flow until the last hose loop has been released.

1. Manufacturer and Model Number:

a. Potter-Roemer 2710
b. Elkhart S-41

G. Pin Lug Coupling: 1-1/2 inch, threaded to pin lug coupling.

1. Manufacturer and Model Number:

a. Potter-Roemer 2930
b. Elkhart 335

H. Fire Hose: 100-foot continuous length of lined fire hose unless otherwise indicated. Provide 1-1/2 inch lug coupling and coupling for nozzle connection. Hose shall be 500-lb. test with synthetic jacket and extruded synthetic lining.

1. Manufacturer and Model Number:

a. Potter-Roemer 2915
b. Elkhart ELK-LITE

I. Extinguisher: 10 pound ABC dry chemical fire extinguisher.

2.08 VALVE CABINET

A. General: Provide valve cabinets as indicated. The valve, reducer and the cabinet shall be of the same manufacturer.

B. Cabinet: Fire department valve cabinet shall be minimum 20-gauge steel, 18 gauge steel frame with gloss white finish. Cabinet shall have clear full glass vision panel, handle, camlock, and continuous piano hinge. The cabinet size shall be a minimum of 18 inches by 18 inches by 10 inches deep. Paint cabinet to match final architectural finishes.

C. Fire Hose Valve: 2-1/2 inch fire hose valve as specified herein, chrome plated.

D. Reducer: 2-1/2 x 1-1/2 inch brass reducer, chrome plated.

E. Cap: 1-1/2 inch cap and chain, chrome plated.

1. Potter-Roemer 1810-A, recessed cabinet.

2. Potter-Roemer 1815-A, surface mounted cabinet.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install underground piping with a minimum of 3 feet of cover over the top of the pipe. Install service utility tape approximately 18 inches above the pipe.

B. Hangers: All hanger spacing and rod sizes shall comply with the requirements of NFPA-13.

C. Sprinkler Head Location: Install sprinkler heads in the center of the ceiling tiles for suspended ceiling applications.

D. Sprinkler Head Location: Sprinkler heads shall be installed no closer than 6 inches to any Ceiling grid or wall.

E. Gauges: Provide gauges and gauge valves at the top of each standpipe, roof manifold, and on sprinkler risers. Gauge scale shall be 0-300 psi unless otherwise indicated.

F. Flushing: The entire system shall be flushed with clean water to remove debris resulting from installation. Flush through a burlap bag to retain debris for examination.

G. Prohibited: Do not paint the covers of concealed sprinklers.

H. Provide drain valves, pipes and test connections as required by NFPA-13. Pipe drain lines and test connections to the exterior of the building or as indicated on the drawings.

I. Drain plugs shall be installed on trapped sections of piping 5 gallons or less. Auxiliary drain valves, ¾ inch or larger and plugs shall be installed on trapped sections of pipe greater than 5 gallons.

J. Hose Valves shall be installed in accordance with the authority having jurisdiction.

3.02 EQUIPMENT INSTRUCTION PLATES

A. General: Provide engraved instruction plates detailing emergency procedures at each system control panel and at each hazard area manual discharge station locations. Permanent nameplates shall be used in the control panel to identify control logic units, contactors and major circuits.

3.03 HYDROSTATIC TESTS

A. General: Above ground and below ground piping systems shall be hydrostatically tested at not less than 200 psi pressure, or at 50 psi in excess of the maximum pressure, whichever is greater, for a period of 2 hours. The test pressure shall be read from a gauge located at the low elevation point of the individual system or portion of the system being tested. The underground piping shall not have leakage exceeding the amounts specified in NFPA 24. Leakage quantities shall be determined by pumping at the specified test pressure from a calibrated container. Repair leaking joints and retest as necessary until all systems have been tested. Test the piping between the check valve in the fire department inlet pipe and the outside connection the same as the balance of the system.

3.04 SYSTEM INSPECTION AND CHECKOUT

A. General: After the installation is complete, the system shall be inspected by factory trained personnel in accordance with the manufacturer's recommended procedures.

B. System Operation: Operate systems as required to demonstrate that the systems are operating in accordance with the design, including line pressure testing. Supply instruments required to read data. Adjust systems to operate at the required performance levels. Advise Architect 7 days prior to testing. Tabulate data and submit on 8-1/2 x 11-inch sheets with time, name of tester and the local authority having jurisdiction and witnessing the test, with one copy for each Technical Information Brochure.

3.05 INSTRUCTIONS TO OWNER

A. General: Provide to Owner's designated representatives a minimum of 2 hours on-site instructions in operation and maintenance of all fire protection systems and equipment. Furnish 6 sets of typed operating instructions. Written and signed acknowledgement of the instructions seminar shall be submitted prior to final acceptance. Submit in writing to the Owner an "Instruction in Operation Conference" notification of the mutually agreed upon time for the conference. At the end of the conference, 6 copies of an Instruction in Operation Conference Memo shall be signed by all parties and one copy shall be inserted in each Technical Information Brochure.

END OF SECTION 15300-1

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. The work pertaining to this Division occurs within the confines of the building line, and within a boundary outside of the building line for a distance of five (5) feet, measured normal to the building line, or as indicated on the drawings.

B. Alternates may or may not substantially change scope and general character of the work; and must not be confused with "change orders", "substitutions", and other similar provisions.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SUBMITTALS

A. Submit manufacturer's data for review before any work is commenced.

PART 2 - PRODUCTS

2.01 PIPING SPECIALTIES

A. Where it is desirable or necessary to support the pipe hangers to concrete, inserts shall be placed in the forms by the Mechanical Contractor prior to the time concrete is poured.

B. Lead tamp-ins may be used when installed in a concrete or masonry wall or other like vertical surface to support a vertical hanger. Lead tamp-ins will not be permitted to support hangers to the underside of concrete slab.

C. For parallel runs of above ground suspended piping, an acceptable trapeze-type hanger may be used. Provide permanent, non-conductive type wrapping between copper pipe and steel trapeze hangers.

D. Pipes passing through walls, floors shall have sleeves of the same materials as the pipe. Sleeves shall allow insulated pipes to pass without changing the insulation thickness. Clearance around sleeves shall be packed with glass fiber after completion of pipe work. Sleeves in all floor slabs except slabs on grade shall have pipe sleeves extended 1 inch above finish floor to prevent water from running through sleeves to area below. Make watertight, caulk with sealant around each sleeve in lieu of above Proset system may be used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The contractor shall furnish all labor, materials, *including gases* equipment and instruments required to conduct tests of piping systems. Tests shall be as herein called for.

B. Tests shall be conducted and the inspection of the piping shall be made in the presence of the Architect, Engineer or County Building Department.

C. Material and/or joints found defective shall be replaced and/or corrected and additional tests shall be conducted after correction of work.

3.02 PIPE SIZING, DRAWINGS AND SPECIFICATIONS

A. It is intended that work covered by these specifications and drawings include everything requisite and necessary to make the various systems complete and operative, irrespective of whether or not every item is specifically provided for. Any omission of direct reference herein to any essential item shall not excuse contractor from complying with the above intent.

B. Figured dimensions supercede scaled ones. Contractor shall take no advantage of, and shall promptly call the Owner's Representative's attention to any error, omission or inconsistency in specifications and drawings.

C. Special attention is directed to requirements that equipment and materials stated in specifications and/or indicated on drawings shall be furnished, except if otherwise noted, completely installed, adjusted and left in safe and satisfactory operating condition. Accessories, appliances and connections necessary for operation of equipment shall be provided to satisfaction of the Owner's Representative.

D. Materials, apparatus or equipment specified or otherwise provided for on drawings, addenda, or change orders issued subsequent to award of contract shall be same brand, type, quality and character originally specified unless otherwise provided.

E. Layout of equipment, accessories, specialties and suspended, concealed or exposed piping systems are diagrammatic unless dimensioned. In preparing shop drawings, contractor shall check project conditions before installing work. If there are any interferences or conflicts, they shall be called to attention of the Owner's Representative immediately for clarification.

F. The drawings indicate required size and points of termination of pipes and ducts and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this contractor to make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further obstruction or cost to the Owner.

G. Shop drawings shall be furnished by this contractor, indicating all changes to meet space requirements, code requirements and as necessary to resolve all space conflicts.

H. It is intended that all apparatus be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings. Refer to architectural details in completing and correlating work.

I. The contractor shall fully inform himself regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the contract, prior to submitting his bid. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.

J. The contractor shall carefully examine any existing conditions, existing piping and ducts and premises and compare the drawing with the existing conditions, prior to submitting his bid.

K. It cannot be too strongly emphasized that, except for work specifically excluded herein, every system shall be turned over to Owner installed completed, with components, ready for normal operation.

L. In addition to work shown on mechanical drawings, see Architectural Drawings for existing work to be removed, relocated and/or modified. Modify existing systems by rerouting for systems to remain or remove the abandoned systems as required to accommodate new general construction, plumbing, electrical and mechanical work.

M. Pipe sizes shall be minimum as allowed by local codes or as shown on the drawings, whichever is larger.

END OF SECTION 15400

Intentionally Left Blank

SECTION 15401

SANITARY SEWER, STORM WATER AND SANITARY VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. The work pertaining to this Division occurs within the confines of the building line, and within a boundary outside of the building line for a distance of five (5) feet, measured normal to the building line, or as indicated on the drawings.

B. Alternates may or may not substantially change scope and general character of the work; and must not be confused with "change orders", "substitutions", and other similar provisions.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SUBMITTALS

A. Submit manufacturer's data for review before any work is commenced.

PART 2 - PRODUCTS

2.01 MATERIAL

A. The following schedule covers materials unless otherwise specified under a particular System Section.

2.02 PIPE

A. Above Ground:

1. PVC Type DWV, ASTM D2665-78.

B. Below Ground:

1. PVC Type DWV, ASTM D2665-78.

C. Piping in air plenums

1. No hub cast-iron with DWV fittings.

2.03 FITTINGS

A. PVC Type DWV: ASTM D-2665, NSF Seal of Approval, Solvent-cement joint.

2.04 VENT FLASHING

A. Furnish 4 lb. lead flashing, material as recommended by roofing system manufacturer, or copper pitch pans for all vents through the roof. Type of flashing used shall be compatible with piping material.

2.05 IDENTIFICATION

A. Below grade piping identification and warning tape shall be 0.004 inch thick polyethylene, printed with a continuous two line message. Tapes used for non magnetic piping materials shall have a metallic core. Acceptable manufacturer is Seton Name Plate Corporation or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. The design drawings are generally diagrammatic. They do not show every bend, off-set, elbow or other fitting which may be required in the piping for installation in the space allotted. Careful coordination of the work is necessary to avoid conflicts.

B. PVC piping, fittings and other PVC materials shall not be installed exposed in air conditioning plenums or equipment rooms used as air conditioning plenums.

C. Joints and connections shall be made permanent and watertight.

D. Run piping to sewer connection point outside of building or as indicated on drawings.

E. Install 3" and larger horizontal soil and waste piping to 1/8" per foot slope. Piping 2" and smaller shall be installed at a slope of 1/4" per foot. Run horizontal vent lines to a minimum grade back to stacks and vertical vent lines as direct and free from bends as possible.

F. For piping requiring insulation, lay out and carefully install piping with sufficient clearances to permit proper application of the insulation. If the piping is such that a neat insulation job cannot be obtained with reasonable effort, the piping subcontractor shall relocate piping.

G. Separate underground water piping and building sewer with undisturbed or compacted earth at least 10' horizontally if installed at the same level or lower than the sewer. Where water piping is closer than 10' to a sewer, place the bottom of the water pipe at least 18" above the top of the sewer, or the sewer shall be encased in a concrete envelope as required by the Department of Health & Rehabilitative Services (State of Florida).

H. Minimum cover for exterior underground piping is three feet over conduit unless otherwise noted on plans. Carefully excavate trench to smooth finished surface; if cut is too deep, backfill with clean earth and hand tamp to compact bottom. Make depression at joints to receive bells, collars, and couplings. Provide continuous support for pipe or conduit. Backfill to be clean earth, free of rocks and debris completely enveloping pipe or conduit on both sides and top to a minimum thickness of 6". Carefully hand tamp backfill in 6" layers until 18" has been deposited over pipe or conduit.

I. Place color coded 6" wide 0.004" thickness polyethylene printed plastic identification tape directly above all underground piping systems approximately 12" below finished grade. Tapes shall be continuously printed with "CAUTION" in large bold letters. Printed second line with type of service below. Red tape is to be used for sewer, (Print type of water on tape; i.e., storm water.)

3.02 HANGERS AND SUPPORTS

A. Vertical Piping shall be supported at its base and no greater than every story height, not to exceed 20 foot intervals.

B. Horizontal Piping (Suspended) shall be supported at each bend; at not more than five (5) foot intervals; except that pipe exceeding five (5) feet in length may be supported at not more than ten (10) foot intervals. Supports shall be adequate to maintain alignment and prevent sagging and shall be made directly behind the bell or coupling, where possible, not near the center of the pipe.

C. Supports shall be connected to the building structure not from other equipment, ducts or conduits.

D. Horizontal pipe and fittings six inches and larger shall be suitably braced to prevent horizontal movement. This should be done at every branch opening or change of direction by the use of braces, blocks, rodding or other suitable method, to prevent movement.

E. Where components are suspended in excess of eighteen inches by means of non-rigid hangers, they should be suitably braced against movement horizontally, often called sway bracing.

3.03 LINE AND GRADE

A. Install gravity lines at uniform grade to low point after field verification of low point invert.

B. Run piping straight, plumb and grade in the direction indicated on the drawings.

3.04 JOINTING PIPE

A. All pipe lines shall be correctly aligned before joints are made.

B. Squarely cut pipe and properly ream to remove all constriction and burrs before making up the joints.

C. Joining "NO-HUB" cast iron soil pipe and fittings shall be in accordance with recommended practices described by the coupling manufacturers.

D. Provide nipples of same material and weight as pipe used. Provide extra strong nipples when length of unthreaded part of standard weight nipple is less than 1-1/2".

E. Provide reducing fittings (reducing bushings shall not be used) where changes in pipe sizes occur.

F. Provide dielectric unions or flanges between copper and steel piping and between brassware and steel. Do not use steel and copper piping in the same system without such isolation.

3.05 TESTS

A. A water test shall be applied to the sanitary and storm drainage systems either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening and the system filled with water to point of overflow. if the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than 10 ft. head of water. In testing successive sections at least the upper 10 ft of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 ft of the system) shall have been submitted to a test of less than a 10 ft head of water. The water shall be kept in the system, or in the portion under test, for at least 30 minutes before inspection starts; the system shall then be tight at all points.

B. Complete all field testing prior to insulation, wrapping and/or backfill.

3.06 VENT FLASHING

A. Extend lead type flashing 12" beyond pipe in all directions and carry to top of pipe with at least 2" return inside of pipe.

B. Install flashing materials as required by roofing system manufacturer's details and methods.

3.07 BASE OF STACKS

A. Offsets and elbows at the base of all stacks shall be done with short radius sweep type elbows.

END OF SECTION 15401

SECTION 15402

DOMESTIC COLD AND HOT WATER SUPPLY PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. The work pertaining to this Division occurs within the confines of the building line, and within a boundary outside of the building line for a distance of five (5) feet, measured normal to the building line, or as indicated on the drawings.

B. Alternates may or may not substantially change scope and general character of the work; and must not be confused with "change orders", "substitutions", and other similar provisions.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SUBMITTALS

A. Submit manufacturer's data for review before any work is commenced.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide valves and specialties as specified under additional Sections of this Specification.

2.02 PIPE

A. The following schedule covers materials unless otherwise specified under a particular System Section.

1. Copper tube, Type L, hard drawn, ASTM B 88 for risers, CPVC piping may be used for branch piping.

2. Brass pipe or tube, chrome plated.

3. Underground piping shall be schedule 80 PVC or CPVC piping with solvent cement joints and CPVC only within foundation walls.

2.03 FITTINGS

A. Copper Tube: Wrought or cast brass solder joint.

2.04 PIPE JOINTS

A. Joints in copper piping shall be made with tin-antimony solder (95-5) and non-acid flux. contractor shall furnish manufacturers literature documenting that the lead content (trace quantities) are within the guidelines of the local codes having jurisdiction as well as the Safe Drinking Water Act Amendment (SDWAA).

B. Victaulic couplings and T-drill fittings may be used on piping 2" and larger. If T-drill system is used, joints shall be silver soldered or brazed and be lead free.

PART 3 - EXECUTION

3.01 GENERAL

A. The design drawings are generally diagrammatic. They do not show every bend, off-set, elbow or other fitting which may be required in the piping for installation in the space allotted. Careful coordination of the work is necessary to avoid conflicts.

B. Run all water lines parallel or perpendicular to building lines.

C. For piping requiring insulation, lay out and carefully install piping with sufficient clearances to permit proper application of the insulation. If the piping is such that a neat insulation job cannot be obtained with reasonable effort, the piping subcontractor shall relocate piping.

D. Separate underground water piping and building sewer with undisturbed or compacted earth at least 10' horizontally if installed at the same level or lower than the sewer. Where water piping is closer than 10' to a sewer, place the bottom of the water pipe at least 18" above the top of the sewer, or the sewer shall be encased in a concrete envelope as required by the Department of Health & Rehabilitative Services (State of Florida).

E. Minimum cover for exterior underground piping is three feet over insulation or conduit unless otherwise noted on plans. Carefully excavate trench to smooth finished surface; if cut is too deep, backfill with clean earth and hand tamp to compact bottom. Make depression at joints to receive flanges, collars, and couplings.Provide continuous support for pipe or conduit. Backfill to be clean earth, free of rocks and debris completely enveloping pipe or conduit on both sides and top to a minimum thickness of 6". Carefully hand tamp backfill in 6" layers until 24" has been deposited over pipe or conduit.

F. Place color coded 6" wide 0.004" thickness polyethylene printed plastic identification tape directly above all underground piping systems approximately 12" below finished grade. Tapes shall be continuously printed with "CAUTION" in large bold letters. Printed second line with type of service below. Yellow tape is to be used for water, (Print type of water on tape; i.e., domestic cold water.)

3.02 HANGERS AND SUPPORTS

A. Vertical Piping shall be supported at its base and no greater than every story height.

B. Horizontal Piping (Suspended) shall be supported at not more than eight (8) foot intervals. Supports shall be adequate to maintain alignment and prevent sagging.

C. Supports shall be connected to the building structure not from other equipment, ducts or conduits.

3.03 JOINTING PIPE

A. All pipe lines shall be correctly aligned before joints are made.

B. Squarely cut pipe and properly ream to remove all constriction and burrs before making up the joints.

C. Copper Tube: Ream all pipe after cutting squarely, clean outside of tube ends and inside of fittings and tin end to be soldered. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

D. Provide nipples of same material and weight as pipe used. Provide extra strong nipples when length of unthreaded part of standard weight nipple is less than 1-1/2".

E. Run water supply main to point indicated on plans.

3.04 AIR CHAMBERS

A. Minimum height of 12". Provide at each fixture, risers and ends of supply lines.

3.05 WATER HAMMER ARRESTERS

A. Water hammer arresters (shock stops) shall be installed at the locations on the plans and in accordance with PDI Standard WH-201 and as recommended by manufacturer. Provide access panels so located to permit ease of service.

3.06 VALVES

A. Provide valves to isolate each riser, and branch line. See also Section 15460 for requirements.

3.07 REDUCERS

A. Screwed bushings are prohibited, except where available space prevents use of reducing couplings. Pipe reductions on horizontal, hot water piping shall be made with eccentric reducers. Top of hot water piping shall be flat for venting.

3.08 TESTS

A. Apply a water pressure test to all parts of the water supply system before the piping is concealed and before the fixtures and equipment are connected. Use a hydrostatic pressure of not less than 100 psig or 150% of system operating pressure, applied to the system for a period of four hours. There shall be no leaks at any point in the system at this pressure.

B. Leave concealed work uncovered until required tests have been completed, but if necessary, make tests on portions of the work and those portions of the work may be concealed after being inspected and approved. Make repairs of defects that are discovered as a result of inspection or tests with new materials. Caulking, welding or other such sealing methods of screwed joints, cracks or holes will not be accepted. Repeat tests after defects have been eliminated.

C. Complete all field testing prior to insulation, wrapping and/or backfill.

3.09 STERILIZATION

A. As soon as the water piping has been thoroughly flushed out, sterilize the lines by introducing into them a solution of calcium hypochlorite or chloride of lime. Open and close all valves while system is being chlorinated. After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 10 parts per million is indicated, repeat the process. When tests show at least 10 parts per million of residual chlorine, flush out the system until all traces of the chemical used are removed. Make necessary connections to sterilized piping.

3.10 PIPE PROTECTIONS

A. Wrap pipe that touches metal or is exposed to masonry with a layer of 6 mil polylene film or 15 lb. felt.

B. Spirally wrap all pipe lines embedded in concrete with two layers of 30 lb. felt.

END OF SECTION 15402

SECTION 15410

PLUMBING PIPING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Basic Requirements: Provisions of Section 15010, BASIC MECHANICAL REQUIREMENTS, are a part of this Section.

1.02 SUMMARY

A. General: Provide domestic water piping, drainage waste and vent piping, and other plumbing piping and appurtenances as indicated.

1.03 ADDITIONAL REQUIREMENTS

A. Related Sections: Other Sections of Division 15 which relate to the requirements of this Section may include but are not limited to the following:

1. 15050, BASIC MECHANICAL MATERIALS AND METHODS
2. 15060, PIPE AND FITTINGS
3. 15100, VALVES
4. 15120, PIPING SPECIALTIES
5. 15250, THERMAL INSULATION
6. 15440, PLUMBING FIXTURES
7. 15450, PLUMBING EQUIPMENT

B. Related Divisions: Other Divisions or Sections of these specifications which relate to the requirements of this Section may include but are not limited to the following:

1. Division 1, ALTERNATES

1.04 SUBMITTALS

A. General: Refer to paragraph entitled "SUBMITTAL" in Section 15010. Provide shop drawing and/or manufacturer's data sheet for the following items:

1. Manufacturers Literature:

a. Product data for non-recirculating hot water system
b. Product data for valve boxes and accessories
c. Dimensional outline drawing of domestic hot water recirculation pump, including motor horsepower, voltage and phase.
d. Complete list of all piping materials to be used in this section including valves, pipe schedules, pipe sizes and method of connection for each piping system.

1.05 APPLICABLE STANDARDS

A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the paragraph entitled "Code Compliance" in Section 15010.

PART 2 - PRODUCTS

2.01 GENERAL

A. Application: The plumbing piping system shall only be of the materials indicated. Refer to Section 15060, PIPE AND FITTINGS, and Section 15250, THERMAL INSULATION, for material specifications. Insulation shall comply with ASTM E-84 requirements with a flame spread rating not exceeding 25 and with a smoke developed/fuel contributed rating not exceeding 50.

B. Valves: All valves used in the plumbing piping shall be as specified herein this section. Refer to Section 15100, VALVES, for complete material specifications.

C. Manufacturer: Refer to paragraph entitled "MANUFACTURERS" in Section 15010.

2.02 DOMESTIC WATER PIPE

A. Above Ground:

1. Piping 4 inches and smaller shall be copper tube, Type L, hard drawn.

2. Piping 6 inches and larger shall be schedule 40 galvanized steel pipe.

3. Exposed piping in finished areas shall be chrome-plated brass pipe or chrome-plated brass tubing.

B. Underground:

1. Type K soft drawn copper tubing without joints shall be used up to 2 inch diameter.

2. Schedule 40 galvanized steel.

3. Class 52 cement lined ductile iron for pipe 3 inches and larger.

C. Fitting:

1. Threaded: Threaded fittings for galvanized pipe shall be galvanized. Rigid grooved couplings and fittings will be allowed for all above ground piping of galvanized steel.

2. Copper Piping: Fittings on copper piping 4 inch and smaller shall be wrot solder joint fitting in accordance with ANSI B16.22 and cast fittings per ANSI B16.18.

3. Ductile Iron: Cement-lined ductile iron fittings shall be mechanical joint.

2.03 SANITARY WASTE AND VENT PIPING

A. Above Ground:

1. Cast iron soil pipe, service weight, with bell and spigot joints.

2. Cast iron soil pipe, service weight, with no-hub couplings. For above ground installation only.

3. Copper:

   a. Type DWV with soldered joints.

   b. Type M with soldered joints for vent piping only.

4. Brass pipe or tube, chrome plated, where exposed in finished areas.

   a. Type DWV schedule 40, ASTM D-1784 and D-2665.

B. Below Ground:

1. Cast iron soil pipe, service weight, with bell and spigot joints.

C. No-Hub Couplings shall be as specified in section 15060 except that, Standard C.I.S.P.I. couplings shall be permitted on vent piping only.

2.04 CONDENSATE DRAIN PIPING

A. General: Unless otherwise specifically noted condensate drain piping shall be the same as sanitary waste and vent piping.

2.05 STORM WATER PIPING

A. Above Ground:

1. Cast-iron soil pipe, service weight, with bell and spigot joints.

2. Cast-iron soil pipe, service weight, with no-hub couplings. For above ground installation only.

B. Below Ground:

1. Cast iron soil pipe, service weight, with bell and spigot joints.

2.06 THERMAL INSULATION

A. General: All insulation, jackets and adhesives used shall comply with the requirements of ASTM E-84 with a maximum flame spread rating of 25 and a maximum smoke developed/fuel contributed rating of 50. Insulation on piping exposed in boiler rooms, mechanical equipment rooms, air handling equipment rooms, etc. or exposed on the exterior of the building shall be cellular glass. Insulation for concealed piping shall be preformed pipe insulation as follows:

1. Interior Domestic Cold Water:

   a. None

2. Interior Domestic Cold Water:

   a. Fiberglass
   b. Elastomeric
   c. Polymer Foam

3. Exterior Domestic Cold Water: Piping shall be considered exterior wherever it is subject to freezing, such as, exposed under overhangs, in parking garages, etc.

   a. Fiberglass
   b. Elastomeric
   c. Polymer Foam

4. Domestic Hot Water:

   a. Fiberglass
   b. Elastomeric
   c. Polymer Foam

5. Condensate Drain:

   a. Elastomeric
   b. Polymer Foam

6. Storm Water:

   a. Fiberglass
   b. Elastomeric
   c. Polymer Foam

B. Thickness: The insulation thickness in inches shall be in accordance with the following table:

TABLE - PIPING INSULATION THICKNESS

Pipe Size, Inches	Up to 1	1-1/4 to 2	2-1/2 to 4	5 to 6	8 & Up
Cold Water	1/2	1/2	1/2	1/2	1/2
Hot Water	1	1	1-1/2	1-1/2	1-1/2
Condensate Drain	1/2	1/2	½	1/2	1/2
Storm Water	1/2	1/2	½	1/2	1/2*

* (Or manufacturer's minimum thickness based on the pipe size.)

C. Exposed: For piping, other than domestic cold water, exposed to the outdoor air or in an unconditioned crawl space or cellar area, increase insulation thickness by 1/2 inch.

D. Underground: Underground piping, which is indicated to be insulated shall have elastomeric insulation or shall be a pre-insulated pipe system.

2.07 VALVES

A. General: Refer to the requirements of Section 15100, VALVES, for the complete requirements of all valves indicated in this section.

B. 4 inch and smaller: Valves 4 inch and smaller shall be full port ball valves with bronze or brass body and bronze trim, threaded or soldered connections.

C. 6 inch and larger, above ground: Valves 6 inch and larger shall be O.S.& Y. valves with flanged, welded or mechanical joint connections, cast iron body with bronze trim.

D. Butterfly valves shall not be permitted on domestic water systems.

E. Underground: Valves underground shall be gate-type with cast iron body and bronze trim, flanged or welded connections, and non-rising stem with square wrench nut head.

F. Valve Box: Valve boxes for underground valves shall be cast iron construction with sufficient extension sections to extend flush to finished grade. Provide a cast iron lid and collar, with the word "water" cast into the lid. Provide a steel "T" handle valve operating wrench of sufficient length to operate the installed underground valve and provide a minimum 12 inches above finished grade; valve operating wrench shall be provided with a cast iron or steel socket compatible with the valve stem head.

1. Acceptable Manufacturers: Mueller, Stockham, U.S. Pipe Metroseal, Kennedy

2.08 HANGERS

A. Reference Section 15050 for Basic Hanger Materials and Spacing Requirements.

B. Additional Plumbing Hanger Requirements:

1. Copper piping installed within metal stud walls shall be supported with manufactured isolators. Isolators shall be Pipe-tytes or approved equivalents.

2. Non-insulated copper pipes installed on trapeze hangers shall have isolation clamps. B-Line "Vibra Cushion", "Vibraclamp" or approved equivalent shall be provided. Wrapping the pipe with tape shall not be acceptable.

PART 3 - EXECUTION

3.01 GENERAL

A. Location of Vents: Vents shall be offset as required to penetrate roofs at least 3 feet from the edges of the building, and 15 feet from any supply air intake or operable window or door.

B. Slope: Unless otherwise indicated, horizontal sanitary and storm piping 2-1/2 inches and smaller shall be sloped at a minimum of 1/4 inch per linear foot; piping 3 inches and larger shall be sloped a minimum of 1/8 inch per foot.

C. Vent Piping: Horizontal vent branches shall be kept above the highest fixture served by the vent branch in order to prevent the vent from being used as a waste line. Horizontal vent branches shall be sloped upward to prevent accumulating water or trapping.

D. Vent Connections: Vent piping connected to a horizontal pipe shall be taken from the centerline of the pipe. Vent piping shall rise at an angle not exceeding 45 degrees from vertical, to a point at least 6 inches above the flood rim of the highest attached fixture.

E. Vent Flashing: Refer to architectural details and specifications for proper flashing requirements of vent piping through the roof.

3.02 INSULATION

A. Horizontal Storm Water: Insulation shall begin at the base of the roof drain and include all horizontal piping and elbows at change of directions from the horizontal to the vertical.

B. Condensate Piping: Insulate condensate piping and waste lines from ice machines with a minimum of 1/2 inch thickness elastomeric insulation.

C. Floor Drains and traps: Insulate all floor drain bodies and traps receiving condensate with a minimum ½" elastomeric insulation. Insulation shall extend 10 feet horizontally from the P-trap of the drain.

3.03 TESTING

A. Sanitary Piping:

1. Water Test: A water test shall be applied to the sanitary and storm drainage systems. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be filled with water. In testing successive sections at least the upper 10 feet of the next preceding section shall be tested, so that no joint or pipe (except the uppermost 10 feet of the system) shall be submitted to a test of less than a 10 foot head of water. The water test shall last for at least 30 minutes. The system shall not experience a drop in water level; if a loss of water is noticed, the system shall be repaired and the test resumed until all sections of the piping are watertight.

2. Pneumatic Air Test: An air test may be made by attaching an air compressor or testing apparatus to any opening and, after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 psi. This pressure shall be held without introduction of additional air for a period of at least 30 minutes. If the test pressure drops, indicating a leak, the piping shall be repaired and the test resumed until all sections of the piping are air tight.

B. Storm Water Piping: Sanitary piping test shall be used for storm water piping.

C. Condensate Drain Piping: Sanitary piping test shall be used for condensate drain piping.

D. Domestic Water Piping: Pressure testing and sterilization shall be performed as described in Section 15060, PIPE AND FITTINGS.

END OF SECTION 15410

SECTION 15421

FLOOR DRAINS AND SHOWER DRAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Furnish and install floor drains and shower drains including strainers and trap primers.

B. Alternates may or may not substantially change scope and general character of the work; and must not be confused with "change orders", "substitutions", and other similar provisions.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SUBMITTALS

A. Submit manufacturer's data for review before any work is commenced.

PART 2 - PRODUCTS

2.01 DRAINS

A. Drains shall be of the type and materials as scheduled on the drawings.

B. Provide all necessary bolts, clamping rings and appurtenances to effect a complete installation.

C. The strainer size shall be as recommended by the manufacturer unless otherwise indicated on the drawings. The strainers shall be nickel alloy or polished brass. Provide tapped boss and trap primer floor drains as indicated on the drawings.

2.02 TRAP PRIMERS

A. Provide for all floor drains.

B. Units shall be cast bronze, with removable top cover, threaded or sweat pattern, and integral vacuum breaker.

C. Acceptable manufacturers are; Wade, Josam, Smith and Zurn.

2.03 SHOWER PANS

A. Shower pans shall be constructed of polyethylene concealed chlorinated waterproofing membrane; nominal 0.040-inch thickness, equal to chloraloy. All joints and/or seams shall be welded tight with CPE (non plasticized chlorinated polyethylene) solvent bonding liquid or xylene.

PART 3 - EXECUTION

3.01 DRAINS

A. Install all drains in accordance with the manufacturers instructions.

3.02 TRAP PRIMERS

A. Trap primer outlet should extend vertically a minimum of 12" before a change in direction to horizontal is made. The horizontal line to the trap primer connection shall be installed sloping to the trap it serves. Provide a minimum size of 12" x 12" stainless steel access cover for each trap primer.

3.03 SHOWER PANS

A. The floor of each individual shower, the shower area portion of combination shower and drying room, and the entire shower and drying room where the two are not separated by curbing or partition shall be made watertight with a shower pan fabricated in place. The shower pan material shall be cut to size and shape of the area indicated, in one piece to the maximum extent practicable, allowing not less than eight inches for turn-up on walls or partitions, and shall be folded over the curb with an approximate return of one-fourth of curb height. The upstands shall be placed behind any wall or partition finish. Shower pans shall be clamped to drain as specified herein. After installation of the pan and the finished floor, the drain shall be temporarily plugged below the weep holes. The floor area shall be flooded with water to a minimum depth of 4 inches at curb areas and 1 inch without curbs for a period of 24 hours. Any drop in the water level during the test, except for evaporation, shall be reason for rejection, repair and retest.

B. When a shower pan of required size cannot be furnished in one piece, the separate pieces shall be joined with solvent bonding liquid. The corners shall be folded tight, not cut, and the corner seam shall be sealed.

END OF SECTION 15421

SECTION 15423

CLEANOUTS AND CLEANOUT ACCESS COVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

B. Alternates may be or may not substantially change scope and general character of the work; and must not be confused with "change orders", "substitutions", and other similar provisions.

1.02 SCOPE

A. Furnish and install cleanouts as shown on drawing or specified herein.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SUBMITTALS

A. Submit manufacturer's data for review before any work is commenced.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleanouts and cleanout access covers shall be of the type and materials as scheduled on the drawings.

B. Provide all necessary bolts, and appurtenances to effect a complete installation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all cleanouts and cleanout access covers in accordance with the manufacturers instructions.

B. Exterior cleanouts below grade shall be extended to finish grade. Pour a concrete pad 18" x 18" x 6" thick around cleanout; slope top down approximately 2" from cleanout to edge of pad so that edge of pad is flush with grade.

C. Cleanouts shall be of the same nominal size as the pipes to which they are connected up to 4" in diameter; and not less than 4" for larger pipes.

D. Cleanouts shall be provided at not more than 50 feet apart in horizontal drainage lines of 4" nominal diameter, and at not more than 75 feet apart for larger diameter pipe.

E. At change in direction: Cleanouts shall be provided at each change of direction of the building drain when the angle of change is 90 degrees.

F. At base of stacks: Cleanouts shall be provided at or near the base of each vertical stack.

G. Direction of cleanout: All cleanouts shall be installed so that the cleanout opens in a direction opposite to the flow of the drainage line, or at a right angle to the line.

H. Concealed cleanouts in wall shall be provided with removable access panel.

I. Where access cleanout boxes or covers are installed in the floor, the top surface shall be scoriated and the cover secured, but removable when necessary. Polished brass. Install carpet type covers in carpeted areas.

END OF SECTION 15423

SECTION 15425

DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SCOPE

A. Furnish and install water heater including all valves, fittings, overflow drain pan, relief valve, heat trap and appurtenances.

B. Alternates may be or may not substantially change scope and general character of the work; and must not be confused with "change orders", "substitutions", and other similar provisions.

1.03 RELATION TO OTHER WORK

A. Refer to the section, "General Mechanical Provisions", for related requirements. Refer to other sections of Division 15 and to all other applicable portions of the Drawings and Specifications.

1.04 SUBMITTALS

A. Submit manufacturer's data for review before any work is commenced.

PART 2 - PRODUCTS

2.01 WATER HEATER

A. Water heater shall be constructed with steel tank constructed to 150 PSI working pressure, 300 PSI test pressure and lined with borosilicate glass bonded to tank. Glass lining to be baked at 1600°F to assure a molecular-interchange between tank and lining. Tank to be protected against electrolytic activity with replaceable factory installed anode rod and factory installed dielectric nipples.

B. Water heater to be provided with fully adjustable temperature controls and automatic high limit control. Unit shall have A.S.M.E. approved temperature and pressure relief valve properly sized for BTU capacity of the unit installed.

C. Water heater shall be insulated to ASHRAE 90-1980A standards and jacketed with manufacturers standard heavy steel jacket.

D. Water heater shall also feature 98% efficient immersion type heating elements. Tin coated, copper sheathed elements shall be provided. All units shall be constructed with factory installed heat traps to increase efficiency and reduce stand-by loss by a minimum of 10%.

E. All units to be U.L. tested and U.L. listed for service as a domestic water heater for voltage inputs of 208V.

F. Water heater shall carry a limited factory warranty of 5 years. Owner to be provided with copy of warranty and operations manuals as distributed by manufacturer.

2.02 WATER HEATER SAFETY PAN

A. Provide a galvanized steel (24 gage min.) or other corrosion resistant material plastic or PVC accepted metal safety pan with a minimum depth of 1-1/2 inches and of sufficient size and shape to receive all drippings and/or condensate from the water storage tank or heater. The pan shall be drained by an indirect waste pipe no less than one (1) inch in diameter or the diameter of the outlet of the required relief valve(s) whichever is larger.

B. The pan drain shall extend full-size and terminate over a suitably located indirect waste receptor or floor drain or extend to the exterior of the building and terminate no less than six (6) inches or more than twenty-four (24) inches above grade.

C. When the discharge from the relief valve(s) is to be discharged into the safety pan, it shall be piped full-size of the valve outlet pipe size to a point not more than two (2) inches or no less than one (1) inch above the pan flood level rim.

D. The discharge from the relief valve shall be piped full-size separately to the outside of the building or to another approved terminal as provided for safety pan drain terminals but in no case shall the discharge from a relief valve be trapped.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide gate valves on both the incoming cold water and leaving hot water supply piping.

B. Provide unions to facilitate replacement of the storage tank and/or heater.

C. Heat trap shall be installed in the hot water supply piping.

END OF SECTION 15425

SECTION 15440

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Basic Requirements: Provisions of Section 15010, BASIC MECHANICAL REQUIREMENTS, are a part of this Section. All fixtures shall comply with FBC Plumbing section maximum water rate flow.

1.02 SUMMARY

A. General: Provide plumbing fixtures, traps, tailpieces, trim, devices and appurtenances as indicated on the contract drawings.

1.03 ADDITIONAL REQUIREMENTS

A. Related Sections: Other Sections of Division 15 which relate to the requirements of this Section may include but are not limited to the following:

1. 15050, BASIC MECHANICAL MATERIALS AND METHODS
2. 15060, PIPE AND FITTINGS
3. 15410, PLUMBING PIPING SYSTEM
4. 15450, PLUMBING EQUIPMENT

B. Related Divisions: Other Divisions of these specifications which relate to the requirements of this Section may include but are not limited to the following:

1. Division 1, ALTERNATES

1.04 SUBMITTALS

A. General: Refer to paragraph entitled "SUBMITTAL" in Section 15010. Provide shop drawings and manufacturer's data sheets for the following items:

1. Manufacturers Literature:

a. Dimensional outline drawing and data sheet for each of the following items:

1) Each type of floor drain or floor sink including trap primer.

2) Shower pan material.

3) Each type of roof drain.

4) Each cleanout and cleanout covers including wall access cover.

5) Water hammer arrester including capacity and pipe connection size.

6) Plumbing fixtures including trim.

1.05 APPLICABLE STANDARDS

A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the paragraph entitled "Code Compliance" in Section 15010.

B. Barrier Free Access: Fixtures indicated to provide Barrier Free access shall be designed, manufactured and installed in accordance with ANSI 117.1-1986; Chapter 553, Part V, Florida Statutes, "ACCESSIBILITY BY HANDICAPPED PERSONS"; and the accessibility requirements manual from the Florida Board of Building Codes and Standards, Department of Community Affairs, 1990 Revision.

C. ASSE: Fixtures and devices shall comply with the standards of the American Society of Sanitary Engineers, where required.

D. ADA: Fixtures, devices and installation clearances and heights shall comply with the requirements of the Americans with Disabilities Act (ADA).

E. PDI: Fixtures and devices shall comply with the standards of the Plumbing and Drainage Institute, where required.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturer: Refer to paragraph entitled "MANUFACTURERS" in Section 15010.

B. Material: Fixtures shall be white vitreous china unless otherwise indicated. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.

C. Quality: Plumbing fixtures shall be "First Quality" as defined and set forth in Commercial Standard CS77-28 as promulgated by the U.S. Department of Commerce. Fixture fittings shall comply with ANSI/ASTM A112.18.1M - 1989. Plumbing trim for water closet bowls, tanks and urinals shall comply with ANSI/ASTM A112.19.5 - 1990.

D. Similar Character and Design: Fixtures and fittings of a similar type shall be from a single manufacturer.

E. Vitreous China Fixtures: Vitreous china fixtures shall comply with ANSI A112.19.2M - 1990.

F. Enameled Cast Iron Fixtures: Enameled cast iron fixtures shall comply with ANSI A112.19.1M - 1986.

G. Porcelain Fixtures: Porcelain enameled steel fixtures shall comply with ANSI A112.19.4M - 1990.

H. Exposed Metal: Exposed metal shall be polished chromium on either brass or bronze, unless otherwise indicated. Supply valves shall have renewable seats and discs. Hot and cold water supply to fixtures shall be provided with stops. Provide P-trap with cleanout for each lavatory and sink except as indicated.

I. Concealed Carriers: Provide a cast iron or steel concealed arm, floor-mounted carrier with cast iron feet and steel uprights to support all wall mounted lavatories, sinks, urinals, and water closets. Carriers shall comply with ANSI A112.6.1.M - 1979 and shall have adjustable support plates, alignment truss, and mounting fasteners. Floor mounted carriers shall withstand an applied vertical load of 250 pounds on the front of the fixture without breaking or permanently deforming. Supports and carriers shall have adjustments capable of permitting field alignment to allow for actual site conditions. Lavatory and sink carriers shall fit within a standard 3 5/8" stud wall.

J. Trap Primers: Traps primers shall be water supply-fed type and shall comply with ANSI/ASSE 1018-86.

K. Vacuum Breakers: Vacuum breakers shall be full-line size, bronze with rough chrome plating, or polished chrome plating where exposed, full-line size, and shall conform to ASSE 1001-1988 or 1020-1988 as applicable.

2.02 FLOOR DRAINS

A. General: Floor drains and floor sinks shall be cast iron, shall comply with ANSI/ASME A112.21.1M - 1990, and shall be adjustable to accommodate the finished floor. Strainer size shall be as recommended by the manufacturer unless otherwise indicated. Strainers shall be polished nickel alloy or polished brass. Provide tapped boss and trap primer connection and flashing flange or clamp, unless otherwise indicated or required.

B. Floor Sinks: Floor sinks shall have cast iron body with acid-resisting enameled interior. Provide with nickel-bronze grate, trap primer connection, and aluminum dome strainer unless otherwise indicated.

2.03 SHOWER PANS

A. Lead Pans: Shower pans shall be constructed from 6 pound per square foot density sheet lead which complies with QQ-L-201a (53) Grade A, except that 4 pound sheet lead may be used for pans installed without joints or seams, other than folded corner seams.

B. Non-Metallic Shower Pan Material: Non-plasticized chlorinated polyethylene (CPE) shower pan material shall consist of minimum 0.040 inch thick sheet material, shaped into pan dimensions as required. The material shall comply with ASTM D412 for tensile strength and elongation, ASTM D4068 for microorganism resistance, and ASTM D568 for non-flammable and non-burning material. Water vapor transmission shall not exceed 0.090 perm. Sheet material shall be cold-solvent welded to cover large surfaces. Preformed corners and curbs may be used.

1. Manufacturer and Model:

a. Noble, Chloraloy 240 or approved equivalent.

2.04 ROOF DRAINS

A. General: Roof drains shall comply with ANSI/ASME A 112.21.2M - 1990 and shall have cast iron body, aluminum dome, gravel stop, flashing flange, and deck clamp, adjustable extension to accommodate insulation thickness, and sump receiver.

2.05 CLEANOUTS AND CLEANOUT ACCESS COVERS

A. Size: Cleanouts shall be at least the same nominal pipe size as the pipe to which they are connected, to a maximum of 8 inch diameter.

B. Material: Cleanouts shall comply with ANSI A112.36.2M - 1983 and shall be water- and gas-tight cast iron construction with adjustable housing to accommodate finished floor or grade elevation. Cleanouts in waterproofed floors shall have a flashing flange and clamp device. Cleanouts shall have a countersunk internal bronze plug and scoriated nickel-bronze removable cover; wall cleanouts shall have polished stainless steel cover specifically manufactured for the wall finish at each location. Floor cleanouts for floors with finish coverings shall have the top recessed for tile or carpet, with a cleanout marker, manufactured for the finished floor material.

C. Access Cover: Access covers for concealed wall cleanouts shall be nickel-bronze with scoriated hinged cover or round stainless steel cover with countersunk machine threaded center screw, unless otherwise indicated.

2.07 ACCEPTABLE FIXTURE MANUFACTURERS

A. Plumbing fixtures: Kohler. American Standard, Eljer, or Crane

B. Commercial Faucets: Kohler, American Standard, Symmons, Zurn, T.& S., or Chicago

C. Supplies: McGuire, Engineered Brass Company, Keeney, Watts and Zurn

D. P-traps: McGuire, Engineered Brass Company, Keeney, Watts and Zurn

E. Stainless Steel Sinks: Just or Elkay

F. Shower Valves: Symmons, Leonard, and Zurn

G. Floor Drains and Cleanouts: Zurn, J.R. Smith, Josam, Watts and Wade

H. Gooseneck Faucets and Wristblades: Chicago, American Standard, T.& S., Kohler, and Zurn

PART 3 - EXECUTION

3.01 GENERAL

A. Vacuum Breakers: Where not provided as an integral part of a device or fixture, provide vacuum breakers at each fixture to prevent back-siphonage.

B. Piping: Plumbing piping to fixtures shall be secured to the wall framing system prior to installation of the wall surface material to assure a solid installation which will not move. Fixture piping which can be moved shall be removed and re-secured to the wall structure; replacement of the wall, finishes, trim, etc. shall be included at no cost to the Owner.

C. Clearances: Install fixtures in accordance with manufacturer's data, with sufficient clearances to coordinate with accessories, specialties and equipment.

D. Mop Sinks: Unless otherwise indicated, mop sinks or basins shall be floor mounted and sealed watertight, at walls and seams. Provide stainless steel back panels on each wall adjacent to the mop sink.

3.02 SHOWER PANS

A. One Piece Shower Pan: The floor of each individual shower, or combination shower and drying room, shall be made smooth and watertight with a shower pan fabricated in place. The shower pan material shall be cut to size and shape of the area with corners folded, in one piece allowing not less than 8 inches for turn-up on walls or partitions, and shall be folded over the curb with an approximate return of 1/4 the curb height. The upstands shall be placed behind the wall or partition finish. Shower pans shall be clamped to the drain.

B. Shower Pan Test: After installation of the pan the drain shall be temporarily plugged below the weep holes. The floor area shall be flooded with water to a minimum depth of 4 inches at curb areas and 1 inch without curbs for a period of 24 hours. Any drop in the water level during the test shall be reason for rejection. The pan shall be repaired and retested until proven watertight.

C. Two Piece Shower Pan: When a shower pan of required size cannot be furnished in one piece, 2 separate pieces shall be joined with a flat-lock seam and soldered or solvent-welded as applicable. Metal pans and upstands shall be coated evenly inside and outside with one brush coat of roofing asphalt at not less than one gallon per 50 square feet. The joining surfaces of metal pan and drain shall be given a brush coat of roofing asphalt after the pan is connected to the drain.

D. Non-Metallic Shower Pan: Follow manufacturer's installation instructions, including solvent-welding seams.

E. Electrically Insulated: Metal shower pans shall be electrically insulated from conductive substances, except the shower drain, by a minimum one layer of 15 pound asphalt felt.

3.03 TRAP PRIMERS

A. Access Covers: Provide a minimum 12 inch by 12 inch stainless steel access cover for each trap primer.

3.04 CLEANOUTS AND CLEANOUT ACCESS COVERS

A. Exterior Cleanouts: Extend exterior cleanouts to finished grade. Provide a concrete pad 18 inches by 18 inches, 6 inches thick around cleanout, flush with final grade.

B. Locations: Cleanouts shall be provided at not more than 50 feet apart in horizontal drainage lines of 3 inch nominal diameter or smaller, and at not more than 75 feet apart for larger diameter pipe. Cleanouts shall be provided at each change of direction of 90 degrees or more. Cleanouts shall be provided in vertical sanitary and storm water piping, with the centerline not more than 18 inches above the finished floor level, at each floor with a horizontal offset or horizontal branch connection.

3.05 INSULATION OF BARRIER-FREE LAVATORY PIPING

A. General: Insulate hot and cold water supplies and p-traps for barrier-free lavatories with pre-manufactured insulation kits. All joints shall be sealed and provided with a white finish.

3.06 DRAINS

A. General: Drains shall be located at the low point of indicated slopes. Install to prevent ponding around the perimeter of the drain.

3.07 FIXTURE INSTALLATION

A. General: Obtain mounting templates and dimensions prior to roughing-in plumbing connections. Mount fixture on carrier which is bolted to the building structure with through-bolts or pre-set inserts. Floor-mounted fixtures shall have supports, blocking or a non-shrink grout setting bed to prevent movement or flexing. Floor-mounted, wall mounted and countertop fixtures shall be sealed watertight with a flexible, non-permeable caulk. Provide stainless steel escutcheons at each water supply and waste piping penetration of a wall or cabinet. Adjust all fixtures level and plumb at proper mounting height.

B. Rough-In: During rough-in, water and waste stub-outs shall be located to prevent gaps between the fixture and the finished wall, and to allow exposed pipe to be installed straight and plumb from the stub-out to the fixture. Continuously cover wall openings and open pipe ends to prevent construction debris from entering.

C. Special Fixtures or Equipment: fixtures or equipment to be connected later or under a separate contract, provide valved and capped water lines; provide floor drains, open site drains, or capped waste connections as indicated or required.

D. Fixture Mounting Criteria: Plumbing fixtures shall comply with the following mounting criteria unless specifically dimensioned otherwise on the drawings:

1. Standard access fixtures:

   a. Wall hung water closet - 15 inches from finish floor elevation to rim of fixture.

   b. Wall hung lavatory - 31 inches from finish floor elevation to rim of fixture.

   c. Urinal - 24 inches from finish floor elevation to the rim of the fixture.

2. Barrier-free Fixtures:

   a. Water closet - 17 inches from finish floor elevation to the rim of the fixture. Install the flush valve handle on the wide side of the toilet stall.

   b. Lavatory - 34 inches from finish floor elevation to the rim of the fixture.

   c. Urinal - 17 inches from finish floor elevation to the rim of the fixture.

   d. Drinking fountain and water cooler - 36 inches from finish floor elevation to spout outlet

END OF SECTION 15440

SECTION 15450

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Basic Requirements: Provisions of Section 15010, BASIC MECHANICAL REQUIREMENTS, and Section 15030, ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT, are a part of this Section.

1.02 SUMMARY

A. General: Provide plumbing equipment including piping, valves, overflow drain pans, relief valves, fitting and appurtenances.

1.03 ADDITIONAL REQUIREMENTS

A. Related Sections: Other Sections of Division 15 which relate to the requirements of this Section may include but are not limited to the following:

1. 15050, BASIC MECHANICAL MATERIALS AND METHODS
2. 15060, PIPE AND FITTINGS
3. 15100, VALVES
4. 15120, PIPING SPECIALTIES
5. 15160, PUMPS
6. 15240, VIBRATION ISOLATION
7. 15250, THERMAL INSULATION
8. 15410, PLUMBING PIPING SYSTEM
9. 15440, PLUMBING FIXTURES
10. 15484, SPECIAL PIPING SYSTEM
11. 15950, BUILDING CONTROL SYSTEM
12. 15990, PERFORMANCE VERIFICATION

B. Related Divisions: Other Divisions of these specifications which relate to the requirements of this Section may include but are not limited to the following:

1. Division 16, ELECTRICAL

1.04 SUBMITTALS

A. General: Refer to paragraph entitled "SUBMITTAL" in Section 15010. Provide shop drawings and manufacturer's data sheets for all equipment.

B. Drawings: Provide ¼" scale drawing for any equipment different from the basis of design to prove that equipment will properly fit in the space provided with clearance for maintenance.

1.05 APPLICABLE STANDARDS

A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the paragraph entitled "Code Compliance" in Section 15010.

B. Florida Energy Code Requirements: The heat loss through the domestic hot water heater exterior jacket and unit operating efficiency shall meet the Florida Department of Community Affairs "Energy Efficiency Code for Building Construction", 1994 Revision.

C. Industry Standards: Where compliance with an industry, society or association standard is specified or indicated, certification of such compliance shall be submitted with the shop drawings.

PART 2 - PRODUCTS

2.01 ELECTRIC WATER HEATERS

A. GAS TANKLESS WATER HEATER

1. Insulation: Water heater shall be insulated to ASHRAE 90.1b standards and jacketed with manufacturers standard heavy steel enamel painted jacket.

2. Temperature Control: Water heater to be provided with fully adjustable temperature controls and automatic high limit control.

3. Exhaust: Provide exhaust duct galvanized sheet metal. Drain piping shall be Type "L" copper. Exhaust shall be placed minimum 10ft. away from air intakes to the building.

4. Air intake: Provide intake duct galvanized sheet metal. Intake shall be placed minimum 10ft. away from exhaust and as directed by manufacturer installation instructions.

5. Testing: All units to be UL tested and UL listed for service as a domestic water heater for voltage inputs as indicated on the drawings.

6. Warranty: Water heater shall carry a limited factory warranty of 3 years.

7. Manufacturer: RINNAI, BOSCH, RHEEM, Hesco Industries, or State Industries.

8. Model Number: See schedule on drawings.

PART 3 - EXECUTION

3.01 GENERAL

A. Installation: Install all equipment where indicated, in accordance with manufacturer's published installation instructions, with recommended clearances provided for service and maintenance. Equipment placement shall be essentially as shown on drawings: however, actual location shall be verified using field measurements and data relating to equipment actually approved for installation on this project.

B. Manufacturer's Field Supervision and Start-up: Provide services of an authorized representative of the manufacturer who shall personally checkout complete installation; and assist in the start-up and test; and calibrate all unit controls and perform such adjustments as may be required to insure optimum performance and efficiency.

C. Field Operating and Maintenance Instructions: Provide on-site instruction by an authorized representative of the manufacturer. Instruction shall be given to Owner's designated operating and service personnel and receipt of it shall be acknowledged in writing prior to request for final payment.

3.02 WATER HEATERS

A. Valves: Provide isolation valves on both the incoming cold water and leaving hot water supply piping.

B. Drain line: Provide drain line tee off exhaust.

C. Thermometers: Provide thermometers on both hot water supply and return piping.

D. Union Connections: Provide dielectric unions to facilitate replacement of the equipment.

E. Provide water heater supports and brackets for wall mounting application. Refer to manufacturer installation manual.

F. Dielectric Connection: Connect to domestic water piping system with dielectric unions or isolation flanges, shutoff valves and a by pass.

END OF SECTION 15450

Intentionally Left Blank