SECTION 15321 - FIRE PUMPS (VERTICAL)

PART 1 GENERAL

1.1 SECTION INCLUDES (SUBMITTAL REQUIRED FOR EACH ITEM)

A. Fire pump package.

B. Electric jockey pump.

C. Controllers.

1.2 RELATED SECTIONS

A. Section 15010 - Mechanical General Requirements.

1.3 REFERENCES

A. NEMA MG-1 - Motors and Generators.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volt Maximum.

C. NFPA 13 - Installation of Sprinkler Systems.

D. NFPA 20 - Installation of Centrifugal Fire Pumps.

E. UL - Fire Protection Equipment Directory.

F. UL 448 - Pumps for Fire Protection Service.

G. UL 1478 - Fire Pump Relief Valves.

1.4 DESIGN REQUIREMENTS

A. Conform to NFPA 20.

1.5 PERFORMANCE REQUIREMENTS

A. Conform to greater of NFPA 20 or NFPA 13.

1.6 SUBMITTALS FOR REVIEW

A. Section 15010 - Mechanical General Requirements.

B. Product Data: Provide manufacturers literature including general assembly, pump curves showing performance characteristics with pump and system, operating point indicated, NPSH curve, controls, wiring diagrams, and service connections.

C. Shop Drawings: Indicate layout, general assembly, components, dimensions, weights, clearances, and methods of assembly.

D. Manufacturer's Instructions: Indicate support details, connection requirements, for fire pump system.

1.7 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 15010 for procedures for submittals.

B. Project Record Documents: Record actual locations of components and accessories.

C. Certificates: Certify that fire pumps meet or exceed specified requirements at specified operating conditions and that the installation complies with regulatory requirements.

D. Operation Data: Include manufacturers instructions, start-up data, trouble-shooting check lists, for pumps, drivers, and controllers.

E. Maintenance Data: Include manufacturers literature, cleaning procedures, replacement parts lists, and repair data for pumps, drivers and controllers.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 20. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience and approved by manufacturer.

D. Design fire pump system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State of Florida.

1.9 REGULATORY REQUIREMENTS

A. Conform to UL.

B. Perform work in accordance with NFPA 20.
C. Conform to NFPA 20 for installation and testing of fire pumps, drivers, and controllers.

D. Equipment and Components: Bear UL label or marking.

E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.10 DELIVERY, STORAGE, AND PROTECTION

A. Protect fire pumps and components from physical damage including effects of weather, water, and construction debris.

B. Provide temporary inlet and outlet caps, and maintain in place until installation.

PART 2 PRODUCTS

2.1 VERTICAL MOUNTED PUMPS

A. Type: On vertical shaft, single stage, direct connected, fire pump

B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, drain plug, flanged suction and discharge.

C. Shaft: Alloy steel with replaceable bronze shaft sleeve.

D. Performance: As indicated on drawings.

2.2 FIRE PUMP ACCESSORIES

2.3 PRESSURE BOOSTER (JOCKEY) PUMP

A. Electrically operated, vertical close-coupled type with open drip-proof vertical motor.

B. Control by automatic jockey pump controller with full voltage starter and minimum run timer to start pump on pressure drop in system and stay in operation for minimum period of time. Fire pump shall start automatically on further pressure drop or on jockey pump failure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 20.

B. Provide access space around pumps for service; no less than minimum as recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For base mounted pumps, provide supports under elbows on pump suction and discharge.

D. Provide drains for bases and seals, piped to and discharging into floor drains.

E. Mount unit on vibration isolators and 4” housekeeping pad.

F. Provide for connection to electrical service.

G. Lubricate pumps before start-up.

H. Check, align, and certify base mounted pumps by qualified millwright prior to start-up.

3.2 FIELD QUALITY CONTROL

A. Perform flow test on entire system in accordance with NFPA 20.

B. Require test to be witnessed by Owner.

3.3 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate automatic operation of system including verification of pressure switch set points.

END OF SECTION

SECTION 15400 - PLUMBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. SCOPE

1. The work covered by this section of the specification consists of providing all materials, labor and equipment required for a complete plumbing installation in accordance with the drawings and specifications, together with items reasonably inferred, including installation of equipment as noted. The intent of the specifications is to include everything necessary for the completion of the work with the materials best adapted to the purpose. Even though every item of the work of materials involved is not shown on the drawings or not particularly mentioned, the Contractor shall furnish same and execute the work to the entire satisfaction and approval of the Architect.

2. The work includes the following items but is not necessarily limited to these:

   a. All drain, waste and vent piping for complete sanitary sewer system as shown on the plumbing drawings.

   b. All storm drainage piping, rain leaders, roof drain, downspout shoe, etc. for complete storm drainage system as shown on the drawings.

   c. All water piping including connecting into water service five feet from building and extending to new fixtures as shown on the drawings.

   d. All materials, equipment, fixtures, insulation, accessories and trim, as shown, specified and/or required to make a complete usable and finished installation.

   e. Necessary trenching and backfilling to install the plumbing system.

   f. All insulation as specified herein.

   g. All gas piping including connecting into the utility company's gas service and extending to equipment as shown on the drawings.

   h. Rough-in, gas, water, sewer and etc. for equipment furnished by others.

1.2 RELATED SECTION

A. Section 15010 - "General Mechanical Requirements".

1.3 REFERENCES

A. ASME - Boiler and Pressure Vessel Code.

B. ASME Sec. 9 - Welding and Brazing Qualifications.

C. ASME A112.6.1M - Supports for the Off-the-Floor Plumbing Fixtures for Public Use.

D. ASME A112.18.1M - Plumbing Fixture Fittings.

E. ASME A112.19.2M - Vitreous China Plumbing Fixtures.

F. ASME A112.19.3M - Stainless Steel Plumbing Fixtures (Designed for Residential Use).

G. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

H. ASME A112.21.1M - Floor Drains.

I . ASME A112.21.2M - Roof Drains.

J. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.

K. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

L. ASME B31.1 - Power Piping.

M. ANSI A13.1 - Scheme for the Identification of Piping Systems.

N. ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

O. ASTM A 53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

P. ASTM A 536 - Ductile Iron Castings.

Q. ASTM B 32 - Solder Metal.

R. ASTM B 88 - Seamless Copper Water Tube.

S. ASTM D 1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

T. ASTM D 2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

U. ASTM D 2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

V. ASTM D 2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

W. ASTM D 2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

X. ASTM D 2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

Y. ASTM F 441 - Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

Z. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

AA. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

BB. AWWA C500 - Gate Valves for Water and Sewerage Systems.

CC. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

DD. AWWA C606 - Grooved and Shouldered Joints.

EE. AWWA C651 - Disinfecting Water Mains.

FF. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.

GG. ARI 1010 - Drinking Fountains, and Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.

HH. ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Types.

II. API Spec 6D - Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves).

JJ. CDA-01 - Handbook: Copper in Architecture.

KK. Florida Building Code – Gas.

LL. Florida Building Code – Plumbing.

MM. FS WW-U-516 - Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections.

NN. MIL-T-27730 - Tape, Antiseize, Polytetrafluoroethylene, with Dispenser.

OO. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

PP. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

QQ. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.

RR. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

SS. PDI G101 - Testing and Rating Procedure for Grease Interceptors.

TT. PDI WH201 - Water Hammer Arrestors.

1.4 SUBMITTALS

A. Submit under provisions of Section 15010, "General Mechanical Requirements".

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 15010, "General Mechanical Requirements".

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 15010, "General Mechanical Requirements".

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

A. Manufacturer's name and pressure rating if applicable marked on each item.

B. Welding Materials and Procedures: Conform to ASME Sec. 9.

C. Welders Certification: In accordance with ASME B31.1.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

A. The Contractor shall comply with all legal regulations that may be necessary for fully completing the work. When the Contractor finds the specifications and/or drawings to be in conflict or not clear, or any portion to be in conflict with any applicable code or regulation, same shall be brought to the attention of the Architect prior to submitting a bid. All work in this section shall be in compliance with the Florida Building Code – Plumbing, the State of Florida Department of Health, Chapter 64E-6, Florida Administrative Code, and the Florida Building Code - Gas. Latest approved edition.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site according to the manufacturer's recommendations.

B. Accept equipment on site in shipping containers with labeling in place. Inspect for damage.

C. Plumbing fixtures and trim shall be protected against damage or injury due to building materials, acid, tools, equipment or any causes incidental to construction. The finished surface of each fixture shall be covered with building paper or similar protection and the fixtures encased in wood box or crate. Chromium-plated surfaces shall be covered to protect their polish. All fixtures damaged by any cause and any trim marred or scratched shall be replaced at no cost to the Owner. The fixture protections shall be removed and fixtures thoroughly cleaned by the Contractor and shall be ready for use by the Owner.

D. All pipe openings shall be enclosed with plugs or caps during construction. The plugs or caps shall be installed when the pipe is roughed in and shall not be removed until final connections are made. Plugs or caps shall be substantial enough to withstand the test pressures of the system as specified herein.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.12 CONNECTIONS

A. Contractor shall contact the Local Utility Companies, prior to submitting a bid, and obtain tap-on information, pay for all permits, fees meter, tap-on fees, main extensions, final connection charges, any and all charges by the gas company, and perform or pay for all work involved to obtain necessary services. All work required shall be done or paid for by this Contractor at no cost to the Owner.

1.13 SITE INSPECTION

A. Before submitting proposals, each bidder shall visit the site and fully familiarize him with all job conditions and shall be fully informed as to the extent of his work. No consideration will be given after bid opening date of alleged misunderstanding as to the requirements of work involved or as to requirements of materials to be furnished.

1.14 COORDINATION

A. To avoid confusion and in the interest of clearness of the mechanical drawings, the work is not always shown to scale or exact location. The Contractor must check all measurements and locations of pipe, fittings, and equipment with the details and architectural drawings and lay out his work at the building, so that all parts of his work

will fit in with other parts of the building. Normally, ductwork and lighting fixtures shall have priority over plumbing lines, except where absolutely necessary for grading purposes.

B. The drawings and specifications shall be considered as supplementary, one to the other, so that materials and labor indicated, called for or implied by the one and not by the other, shall be supplied and installed as though specifically called for by both.

C. This Contractor shall lie out and proceed with his work so that this work will be executed in harmony with all other crafts pertaining to the building. Should any doubt arise as to the meaning of the drawings or specifications, this Contractor shall first obtain the decision of the Architect before proceeding with such work as may be affected. This Contractor shall work in harmony with all other Contractors and trades on the job and install his work as fast as the progress of the job will permit.

PART 2 PRODUCTS

2.1 WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. PVC Pipe: ASTM D 1785, Schedule 40, or ASTM D 2241, SDR-26 for not less than 150 psig pressure rating.
1. Fittings: ASTM D 2466, PVC.
2. Joints: ASTM D 2855, solvent weld with ASTM D 2564 Solvent cement.

2.2 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tubing: ASTM B 88, Type K, soft.
1. Fittings: ASME B16.18, cast bronze or ASME B16.22 wrought copper and bronze.
2. Joints: ASTM B 32, solder, Grade 95 tin-antimony.

2.3 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B 88, Type L, hard drawn.
1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B 32, solder, Grade 95 tin-antimony.

2.4 MATERIALS

A. Labels: All piping shall be labeled in accordance with ANSI A13.1. Arrows shall be used to indicate direction of flow.

B. Unions brass or bronze FS WW-U-516.

2.5 DRAIN WASTE AND VENT PIPING

A. Above Ground:

1. Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fitting, solvent cement joints.

B. Underground Building Drain Piping (within 5 feet of the building):

1. Pipe Size 6" and Smaller: Polyvinyl chloride sewer pipe (PVC); Type DWV; PVC plaster type DWV socket-type conforming to ASTM D 2665.

4. Sanitary sewer piping outside the building shall be as indicated in above.

2.6 GAS PIPING

A. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40, malleable-iron threaded fittings.

B. Gas piping and fittings underground shall be protected with Barrett Primer, hot pipeline enamel, asphalt felt wrapping, hot piping asphalt enamel

2.7 RESTRAINED JOINTS

A. The restrained joints shall be retainer glands with setscrews or wedging type follower. The setscrew mechanical joint retainer glands shall be cast from ductile iron no less than grade 70-50-5 and shall comply with all applicable provisions of AWWA C110 and AWWA C111. Setscrew shall be 5/8-11 NC thread with square head and knurled cup-point made of 4140 steel and shall be hardened to Rockwell "C" scale 45-47. The wedging mechanical joint retainer glands shall be cast from ductile iron conforming to ASTM A 536 and shall comply with all applicable provisions of AWWA C111. The restraining wedge shall be ductile iron heat treated to a minimum hardness of 370 BHN. The joints shall be Factory Mutual (FM) approved and Underwriters Laboratories (UL) listed. The maximum allowable deflection shall be as given in AWWA C600.

B. Pipe Joint Materials: Joints and gaskets materials shall conform to the following:

1. Coupling for Steel Pipe: AWWA C606.

2.8 SOLDER FLUX

A. Flux shall be liquid form, non-corrosive, and in conformance with CDA-01, Standard Test 1.

2.9 JOINT TAPE

A. PTFE Tape, for use with Threaded Metal or Plastic Pipe: MS MIL-T-27730.

2.10 UNIONS AND COUPLINGS

A. Pipe Size 2 Inches and Under:

1. Ferrous pipe: 150 psig malleable iron threaded unions.
2. Copper tube and pipe: 150 psig bronze unions with soldered joints.

B. Pipe Size Over 2 Inches:
1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
2. Copper tube and pipe: 150 psig slip-on bronze flanges, 1/16 inch thick preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.11 GATE VALVES

A. Up to and including 2 Inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, single wedge or disc, solder or threaded ends, MSS SP-80, Class 125.

B. Over 2 Inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, single wedge, flanged or grooved ends, MSS SP-70, Class 125.

2.12 BALL VALVES

A. Up to and including 2 Inches: Bronze two piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.

B. Over 2 Inches: Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, or gear drive hand wheel for sizes 10 inches and over, flanged.

2.13 PLUG VALVES

A. Up to and including 2 Inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

B. Over 2 Inches: Cast iron body and plug, non-lubricated, Teflon packing, flanged ends.

2.14 RELIEF VALVES

A. Bronze body, Teflon seat, steel stem and springs, automatic, test lever, direct pressure actuated, capacities ASME certified and labeled, ANSI Z21.22.

2.15 STRAINERS

A. Strainers shall have blow off outlet with pipe nipple and gate valve.

B. Size 2 inch and Under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.16 HOSE BIBBS

A. Provide angle type copper alloy hose bibb with lock shield and hand wheel. Inlet shall have internal threads. Outlet shall have vacuum breaker with 0.75-inch external hose threads.

2.17 WATER METERS

A. AWWA C701 turbine type, with register reading in U.S. gallons.

2.18 THERMOMETERS

A. Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 5-inch diameter dial with glass face gasketed within the case, accuracy within 2 percent of scale range. Provide scale range suitable for the intended service.

2.19 DIELECTRIC CONNECTIONS

A. Provide at connections between copper and ferrous metal piping materials. ASTM F 441, Schedule 80, CPVC threaded pipe nipples, 4-inch minimum length, may be provided for dielectric connections in pipe sizes 2 inches and smaller.

2.20 WATER HAMMER ARRESTERS

A. PDI WH201.

2.21 WATER VALVE BOXES

A. For each buried valve provide cast-iron, ductile-iron, or plastic box of a suitable size. Provide cast-iron, ductile-iron, or plastic cover for the box with the word "WATER" cast on the cover. Plastic boxes shall be constructed of ABS plastic or inorganic fiber-reinforced black polyolefin plastic. Coat cast-iron and ductile-iron boxes with bituminous paint.

2.22 BACKFLOW PREVENTERS

A. Reduced pressure principle type. Furnish proof that each make, model/design, and size of backflow preventer being furnished for the project is approved by and has a current "Certificate of Approval" from the FCCCHR-USC. Listing of the particular make, model/design, and size in the current FCCCHR-USC will be acceptable as the required proof.

2.23 PIPE HANGERS

A. The pipe hangers shall be constructed according to MSS SP-58.

2.24 GAS VALVES AND ACCESSORIES

A. Shut-Off Valves: Manually operated shut-off valves for gas distribution main and regulator station piping with a minimum pressure rating of 150 psig.

1. Plug Valves: API SPEC 6D for steel valves or MSS SP-78 for cast iron valves. Valves shall be full bore type. Minimum bore size for full bore valves shall be 95 percent of the internal cross sectional area of pipe of the same nominal diameter. Steel valves installed on buried steel piping shall have butt-welding ends. Steel valves installed on buried PE piping shall have mechanical joint ends. Cast iron valves installed on buried piping shall have mechanical joint ends except where flanged ends. Plug valves shall be lubricated. Lubricating fittings on installed valves shall be accessible for re-lubrication, or extensions shall be provided to make them accessible. Plug valves shall be wrench operated. Wrench operated valves shall have a 2 inch square adaptor securely fastened to the valve stem. Maximum allowable operating torque in foot-pounds shall be limited to:

Nominal Valve Size (Inches)	Torque (Foot-Pounds)
3/4, 1, 1-1/2, 2	25

B. Gas Valve Boxes: Provide each valve on buried piping with a cast-iron valve box of a size suitable for the valve. Valve box shall have a round cover with the word "Gas" cast on it. Valve boxes shall be provided with lock-type covers that require a special wrench for removing. Each cast-iron box shall be given a heavy coat of bituminous paint.

C. Drips: Install at low points where indicated. Conform to details indicated or provide commercial units of the same capacity and type as those indicated.

D. ASTM A 53, Grade A, Schedule 40.

2.25 DRAINS

A. ASME A112.21.1M, provide cast-iron or ductile-iron drains and clamping rings for use with membrane waterproofing. Provide P-traps for each floor drain.

B. Flush Strainer Floor Drains: Provide with double drainage flange, perforated or slotted cast bronze or nickel bronze, polished stainless steel, or chromium-plated copper alloy strainer, and adjustable collar. Drains of sizes 2, 3, and 4 inches shall have strainers with minimum free drainage area of 5, 11, and 18 square inches, respectively.

C. Shower Floor Drains: Provide as specified for flush strainer floor drains, except that finish shall be polished stainless steel or chromium-plated copper alloy and PVC drains may be provided for fiberglass shower stalls where fire separation requirements are not violated.

D. Roof Drains: ASME A112.21.2M; provide hot-dip galvanized cast-iron or ductile-iron drains, with minimum of 10-inch diameter body, non-puncturing flashing clamp device with integral gravel stop and deck clamp, and removable cast-iron or ductile-iron or polypropylene locking dome. Free area of dome shall be not less than two times the

free area of drain outlet. Provide drain flashing ring seat flush with adjacent roof deck, and secure rigidly in place with deck clamp.

2.26 GREASE INTERCEPTORS (TRAPS)

A. PDI G101.

2.27 NONFREEZE WALL HYDRANT

A. ASSE 1019, cast bronze, with lock shield and removable hand wheel or tee-handle, one-inch external thread inlet, 0.75-inch external hose thread outlet with automatic draining vacuum breaker. Hydrant shall be of sufficient length to extend through walls and place the valve seat inside the building or in the crawl space. Bonnet and valve stem shall be removable from outside of the building.

2.28 COMBINATION PRESSURE AND TEMPERATURE RELIEF VALVES

A. ANSI Z21.22 copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating.

2.29 ACCESS DOORS

A. Provide 12- by 12-inch factory prefabricated and primed flush face steel access doors including steel door frame with continuous hinges and turn-screw-operated latch. Door frame shall be for installation in plaster and masonry walls. Furnish doors under this section to provide proper access to concealed valves; install doors under the appropriate section of this specification.

2.30 DOMESTIC WATER HEATERS

A. See Drawings.

2.31 TRAP PRIMER

A. Equal to Zurn Z-1022, install below plumbing fixture and extend 1/2" line to floor drains.

2.32 HEAT TRACING

A. All hot, hot water return and cold water located above ceiling shall have UL listed system of heaters, components, thermostats and control to prevent pipelines from freezing.

B. The self-regulating heater shall be equal to Raychem Model No. 5XL-2, 5 watts, 277 volts, the heater selection based on 1" fiberglass insulation on metal piping as shown on plumbing and electrical drawings.

C. The entire installation shall be by the manufacturer's recommendations.

D. Test to be performed by manufacturer's representative. After installation and before and after installing the thermal insulation, subject heat to testing using a 1000 VDC megger. Minimum insulation resistance should be 20 to 1000 mega ohms regardless of length.

2.33 FIXTURES, FITTINGS, ACCESSORIES, AND SUPPLIES

A. Provide control-stop valves in each supply to each fixture. The finish of fittings, accessories, and supplies exposed to view shall be chromium-plated per ASME A112.18.1M. Center set faucets shall be top-mounted with inlets on not greater than 4-inch centers. Provide special roughing-in for wheelchair fixtures.

1. Flush Valve Type Water Closets (P-1): ASME A112.19.2M, white vitreous china, wall hung, wall outlet as indicated, siphon jet, elongated bowl, white solid plastic elongated open-front seat, and ASME A112.19.5 trim. Provide sensor operated battery powered flush valve with override, including vacuum breaker and angle (control-stop) valve with back check, mounted approximately 39 to 44 inches above floor. The water flushing volume of the flush valve and water closet combination shall not exceed 1.28 gallons per flush for floor outlet water closets from 15 to 90 psi. Provide ASME A112.6.1M carrier with feet.

2. Wheelchair Water Closets (P-1A): Provide same as specified for water closets (P-1) except water closet height to top of seat shall be 17 to 19 inches above floor.

3. Flush Valve Type Urinals (P-2): ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, extended side shields, and ASME A112.19.5 trim. Provide sensor operated battery powered flush valve with override, including vacuum breaker and angle (control-stop) valve with back check. Water flushing volume of the flush valve and urinal combination shall not exceed 0.125 gallons per flush from 15 to 90 psi. Provide ASME A112.6.1M concealed chair carriers.

4. Lavatories (P-3): ASME A112.19.2M white vitreous china with ASME A112.6.1M concealed arm carrier support, straight back type, minimum dimensions of 20 inches wide by 18 inches front to rear. Provide ASME A112.18.1M copper alloy self-closing metering faucets with aerator, perforated grid strainers, and 1.25-inch adjustable P-traps. Provide ASME A112.6.1M concealed chair carriers. Maximum water uses 0.25 gpm.

5. Lavatories for Wheelchairs (P-3A): ASME A112.19.2M white vitreous china with ASME A112.6.1M concealed arm carrier support, straight back type, minimum dimensions of 19 inches wide by 16 inches front to rear, 29 inches minimum clearance from bottom of front rim to floor, 34 inches front rim height above floor. Provide ASME A112.18.1M copper alloy self closing metering faucets, gooseneck spout with aerator 5 inches above rim, perforated grid strainers with offset tailpiece, and 1.25-inch adjustable P-trap. Provide ASME A112.6.1M concealed chair carriers.

6. Wall Hung Kitchen Hand Sinks (P-4): ASME A112.19.3M, 20-gage stainless steel with integral mounting rim, minimum dimensions of 14 inches wide by 10 inches front to rear, single compartments with ledge back and undersides coated with sound dampening material. Provide top-mounted ASME A112.18.1M copper alloy faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers. Provide 1.5-inch adjustable P-trap with drain piping to vertical vent stack.

7. Wheelchair Electric Water Cooler (P-6): ARI 1010, wall-mounted split level bubbler style, bottle filler with ASME A112.6.1M concealed chair carrier, air-cooled condensing unit, 4.75 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 27-inch minimum knee clearance from front bottom of unit to floor and 36-inch maximum spout height above floor. Bubblers shall also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

8. Shower (P-5): Shower to be acrylic 60" x 30" with textured slip resistant bottom. Color to be selected by Architect. Shower supply fittings ASME A112.18.1M, vandal proof, ball joint, self-cleaning adjustable spray pattern shower heads with 1.5-gpm flow control devices, connected to concealed pipe connected to copper alloy pressure balance single control type mixing valves with front access integral screwdriver stops. Anchor the mixing valves and the pipe to each shower head in wall to prevent movement. Secure vandal proof shower heads to the wall using anchor plates and interrupted-slot head type exposed screws. Maximum water uses 1.5 gpm. Shower to be equal to Aqua Glass 836336 less grab bars.

9. Shower (P-5A): Shower to be same as above except with grab bars, folding wood grained set and ADA shower supply fitting with hand held shower head, 60" stainless steel flex hose, vacuum breaker and 30" slide bar.

10. Shower (P-5B): Shower to be acrylic 36" x36" with textured slip resistant bottom. Color to be selected by Architect. Shower to be provided with same trim as P-5A. Shower to be equal to Aqua Glass 833941.

11. Non-plasticized Polyvinyl Chloride (PVC) Shower Pans: Nonplasticized PVC shall be turned up behind walls or wall surfaces a distance of not less than 6 inches in room areas and 3 inches above curb level in curbed spaces with sufficient material to fold over and fasten to outside face of curb. Corners shall be pig-ear type and folded between pan and studs. Only top 1 inch of up stand shall be nailed to hold in place. Nails shall be galvanized large-head roofing type. Approved duct tape shall be used on metal framing or studs to secure pig-ear fold and membrane. Where no backing is provided between studs, the membrane slack shall be taken up by pleating and stapling or nailing to studding at top inch of up stand. To adhere the membrane to vertical surfaces, the back of the membrane and the surface to which it is to be applied shall be coated with adhesive that becomes dry to the touch in 5 to 10 minutes, after which the membrane shall be pressed into place. Trim for drain shall be exactly the size of drain opening. Bolt holes shall be pierced to accommodate bolts with a tight fit.

Adhesive shall be used between pan and subdrain. Clamping ring shall be bolted firmly. A small amount of gravel or porous materials shall be placed at weep holes so that holes remain clear when setting bed is poured. Membrane shall be solvent welded with PVC solvent cement. Surfaces to be solvent welded shall be clean (free of grease and grime). Sheets shall be laid on a flat surface with an overlap of about 2 inches. Top edge shall be folded back and surface primed with a PVC primer. PVC cement shall be applied and surfaces immediately placed together, while still wet. Joint shall be lightly rolled with a paint roller, then as the joint sets shall be rolled firmly but not so hard as to distort the material. In long lengths, about 2 or 3 feet at a time shall be welded. On wood subflooring, two layers of 15 pound felt shall be installed prior to installation of shower pan to ensure a smooth surface installation.

12. Floor Sinks (Drains): Provide cast-iron body with white acid-resisting porcelain enameled or epoxy interior, double drainage flange, nickel bronze rim and slotted grate, removable stainless steel or aluminum slotted buckets, and P-trap.

13. Washing Machine Connector Box: Provide recessed wall box fabricated of aluminum, PVC plastic stainless steel, or hot-dip galvanized steel. Provide hot-dip galvanized steel with epoxy or baked-on enamel finish. Provide drain nipple and locknut with cover nut for locking drain outlet to box. Provide brass pipe fittings for connecting each supply pipe to valve and locking to box. Provide hot water and cold water supply valves similar to hose bibbs, except valve inlet connections shall be of the compression type or union type.

2.34 PLUMBING FIXTURE FAUCETS, TRIM, AND FITTINGS

A. ASME A112.18.1M for plumbing fixture faucets. The finish of plumbing fixture faucets, trim, valves, and fittings exposed to view shall be chromium-plated or polished stainless steel except as modified herein. Bolts, nuts, and screws shall be copper alloy or stainless steel. Provide globe valves or angle valves, and union connections in each supply to each faucet; chromium-plated finish is not required. Faucets shall be washerless type and shall have threaded type end connections, coupling nuts, or union connections. Faucets may be of the single control type. Provide washers and locknuts to secure faucets to lavatories and sinks.

1. Traps: Provide P-traps for each plumbing fixture, which does not have integral traps. Provide 1.5 inch white PVC adjustable P-traps and tubing with slip nuts and gaskets; chromium-plated finish is not required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Establish elevations of buried piping outside the building to ensure not less than 2 ft of cover.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Provide support for utility meters in accordance with requirements of utility companies.

L. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting and paint with type of paint recommended for application.

M. Install bell and spigot pipe with bell end upstream.

N. Install valves with stems upright or horizontal, not inverted.

O. Provide one plug valve wrench for every ten plug valves sized 2 inches and smaller, minimum of one.

P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood or use UL approved non-vented regulator.

Q. There shall be no joints under slabs in water piping.

R. Material or equipment containing lead shall not be used in any potable water system.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install gate ball or butterfly valves for shut-off and to isolate all equipment, vertical risers and all branches from mains where shown or not on drawings.

D. When fixtures require both hot water and cold water supplies, provide the hot water supply to the left of the cold water supply.

E. Plastic piping shall not penetrate fire walls or fire floors and shall be used on one side of fire walls and fire floors not closer than 6 inches to the penetration.

F. Joint compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread paste, pipe cement and oil or PTFE powder and oil; apply only on male threads. Provide exposed ferrous pipe threads with one coat of primer applied to a minimum dry film thickness of 1.0 mil. Do not thread metal pipe into plastic piping.

G. Solder End Valves: Remove stems and washers and other items subject to damage by heat during installation. Reassemble valve after soldering is completed. Valves without heat sensitive arts do not require disassembly but shall be opened at least two turns during soldering.

H. Provide additional supports at the concentrated loads in piping between supports, such as for inline water pumps and flanged valves.

I. Piping to Receive Insulation: Provide temporary wood spacers between the insulation protection shield and the pipe in order to properly slope the piping and to establish final elevations. Temporary wood spacers shall be of the same thickness as the insulation to be provided under insulation section. Wood spacers shall be removed.

J. Adapters: Threaded adapters below 2" size shall be female metal to PVC male thread type, 2" and above shall be flanged and gasketed type. No saddle taps allowed.

3.5 ERECTION TOLERANCES

A. Grade: All building sewers shall have a uniform grade of not less than 1/8" to the foot, downward in direction of flow, for pipe 3" and larger. Pipe smaller 3" shall have grade of 1/4" to the foot.

B. Slope water piping and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651.

B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SERVICE CONNECTIONS

A. Provide new water service complete with reduced pressure backflow preventer and water meter with pressure reducing valve.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.8 INSTALLATION OF PIPE SLEEVES

A. Provide pipe sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 0.25-inch space between exterior of piping or pipe insulation and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal at both ends of the sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. Seal both ends of penetrations through fire walls and fire floors to maintain fire resistive integrity with UL listed fill, void, or cavity material. Extend sleeves in floor slabs 3 inches above the finished floor.

3.9 SOIL WASTE AND VENT

A. Soil, Waste and Vent Stacks: Where shown and where required, install soil, waste, and

vent stacks of sizes shown on the drawings and with branches connecting all fixtures and other apparatus requiring waste generally as shown. All connections to risers shall have made with "Y" and eighth bends when possible. Stacks shall be offset at beams, roof flashings, and as necessary to miss other obstruction. Vents shall be connected into vent header and installed at least 10 feet from edge of roof.

B. Cleanouts: All cleanout plugs shall be recessed brass type.

1. Cleanouts to finished floors shall be counter sunk bronze plug, clamp ring and flange, level-eze adjustable housing and with satin finish bronze cover and frame. Floor cleanouts in finished spaces shall be set flush and shall have accessory appurtenances to match type of flooring, such as top recessed for tile, terrazzo cover, carpet market, etc. Cleanouts in finished walls shall be brass with polished stainless steel cover and securing screws. Cleanouts shall be full size of pipe on which installed. Provide cleanouts at base of all stacks.

2. Extension to floor shall be made with combination "Y" and eighth bends.

3. Cleanouts to grade shall be with lead caulked cast-iron fittings with brass countersunk plug, set in a 24" square block of poured concrete, 6" thick. All exterior cleanouts shall be brought to grade. PVC shall not be used for cleanouts to grade.

C. Cast-Iron Pipe Joints: Joints shall be made tight using two ounces of picked oakum tightly caulked with 12 ounces of pure soft pig lead for each joint to each inch diameter of the pipe, except that a greater amount shall be used on a cut piece of pipe without spigot. "No-Hub" joints shall be made with approved materials as recommended by the manufacturer. Draw bands shall be 100% stainless steel. "No-Hub" joints below slab shall cast iron and neoprene coupling with Type 304 stainless steel nuts and bolts as manufactured by MG Coupling or approved equal. Submit for approval.

3.10 HANGERS

A. All horizontal suspended soil and vent pipe shall be supported on hangers and inserts spaced not more than 5'-0" on centers. Hangers on screwed and solder joint pipe shall be not more than 9'-0" on centers. Hangers on PVC pipe shall be provided with saddles arranged to prevent damage to pipe, and shall be spaced so there will be no sagging.

B. All materials to be Standard Catalog items, with rust resistant finish and where exposed to the weather, shall be hot dip galvanized. Hangers and inserts shall be in conformance to Federal Specification WW-H-171, Types 1, 10, 11 and 12 hangers for horizontal pipe and Type 8 hangers for vertical pipes. Inserts shall be Type 18 or 19. Hangers to be used with rods of the following sizes:

Pipe 2" and smaller.....3/8" hanger rod
Pipe 2-1/2" to 3-1/2".....1/2" hanger rod
Pipe 4" and up.....5/8" hanger rod

All hangers, brackets, rods, nuts and all hardware shall be painted, if not galvanized or plated with rust resistant finish.

C. Vertical pipe runs shall be adequately braced and supported in accordance with good practice. Provide suitable means to allow for pipe expansion.

3.11 FLOOR PLATES AND ESCUTCHEONS

A. Provide heavy brass nickel-plated ceiling plates with set screws to hold plates in place on all exposed pipes wherever pipes pass through walls, floors, and ceilings.

3.12 FLASHING

A. All vents shall be run 6" above the roof and shall be flashed and counter flashed. Flashing shall consist of 16 ounce soft copper or 4 pound sheet lead, extending all around not less than 8" from the pipe. The counter flashing shall be turned down into the pipe and shall be made of 16 ounce soft copper or 4 pound sheet lead. On standing seam metal roof flashing as required by roofing manufacturer.

3.13 TESTING

A. All pipe systems shall have pressure test applied before any joints are covered (or buried) or concealed in any manner.

B. Concealed work shall remain uncovered until required tests have been completed. All tests shall be made in the presence of representatives of the Owner. Repairs of defects that are discovered as a result of inspections or tests shall be made with new materials. Caulking of screwed joints, cracks, or holes, will not be accepted. Tests shall be repeated after defects have been eliminated.

C. Drain Systems: A water test shall be applied to all parts of the drainage system before the pipes are concealed or fixtures set in place. The test may be applied in the highest opening above the roof, and the entire system shall be filled with water up to the overflow point of this highest opening. All parts of the system shall be subject to not less than 10 feet hydrostatic head except the uppermost ten feet of the piping directly below the opening. The water shall remain in the system for not less than four hours. If leaks at any joint or lowering of water level occur, make necessary corrections.

D. Water supply tests shall be applied to all parts of the water supply system before the piping is concealed or before the fixtures are connected. A hydrostatic pressure of not less than 100 pounds per square inch shall be applied to the system for two hours and there shall be no leaks at any joint in the system at this pressure.

E. Temporary caps on all stub-outs must withstand the test pressure of the system.

F. Gas Test: Shall conform to Standard Gas Code.

G. Rain leader Test: Shall be in accordance with Standard Plumbing Code.

3.14 INSTALLATION OF FIXTURES AND EQUIPMENT

A. Preparations of rough-in, supports and wall finishes shall be completed and tested or inspected before fixtures or equipment are installed.

B. Installation:

1. Mechanical or plumbing connections shall be made with correct fittings, gaskets or setting compound for each fixture. Seal all brass and trim to walls and fixtures with resilient waterproof compound.

C. Fixture Heights:

1. Unless otherwise shown install fixtures to heights above finished floor as indicated.

2. Water-Closet:

   a. Standard 15 inches to top of bowl rim.

   b. Handicapped 18 inches to top of seat.

3. Urinal:

   a. Standard 22 inches to top of bowl rim.

   b. Handicapped 17 inches to top of bowl rim.

4. Lavatory:

   a. Standard 31 inches to top of basin rim.

   b. Handicapped 34 inches maximum to top of basin rim.

5. Drinking Fountain:

   a. Standard 40 inches to top of basin rim.

   b. Handicapped 36 inches from floor to outlet of spout.

6. Shower Heads:

   a. Standard 78 inches to bottom of head.

   b. Handicapped mounted on 60 inch flexible hose with height adjustment from 42" to 72" above floor.

3.15 START-UP SERVICE

A. The Contractor shall put all items installed under this section into operation and shall instruct the Owner's maintenance personnel in all points requiring service and maintenance. Further, the Contractor shall make all adjustments and/or perform all service requirements to said equipment during the first year at his expense.

3.16 INSULATION

A. Insulation: The following shall be insulated as indicated:

1. Domestic Cold Water Piping and Fittings Located Above Floor and All Hot Water Piping and Fittings. Underground hot water piping shall have appropriate jacketing mastic or vapor barrier adhesive per manufacturer's instructions. Insulate horizontal rain leader piping and roof drains with above insulation and hot water storage tanks.

3.17 NAMEPLATES

A. Provide laminated plastic nameplates for equipment, gages, thermometers, and valves; stop valves in supplies to fixtures will not require nameplates. Laminated plastic shall be 0.125-inch thick melamine plastic, black with white center core. Surface shall be a matte finish. Corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches. Lettering shall be minimum of 0.25-inch high normal block lettering. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule. Each inscription shall identify its function. Equipment nameplates shall show the following information:

1. Manufacturer, type, and model number

2. Contract number and accepted date

3. Capacity or size

4. System in which installed

5. System that it controls

3.18 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

A. Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to the branch. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service. Notify the Contracting Officer in writing at least 15 days prior to the date the connections are required; receive approval before any service is interrupted. Provide materials required

to make connections into the existing water supply systems and perform excavating, backfilling, and other incidental labor as required. Furnish Government will furnish only the labor and the tapping or drilling machine for making the actual connections to the existing systems.

3.19 DEWATERING

A. Plan for and provide the structures, equipment, and construction for the collection and disposal of surface and subsurface water encountered in the course of construction.

B. Surface pumping may be used, except where permanent ground water is present above the excavated surfaces, in which case the well point system shall be utilized.

C. Surface Dewater: Remove water by pumping or other methods to prevent the softening of surfaces exposed by excavation, prevent hydrostatic uplift, and provide a stable trench condition for installation of the utility. Use screens and gravel packs or other filtering systems on the dewatering devices to prevent the removal of fines from the soil. Surfaces drainage water shall be diverted by trenches or other means to prevent water from flowing into excavations.

D. Operate the dewatering system continuously until construction work below existing water levels is complete. Ground water shall not be allowed to rise above the bottom of installed piping, grease trap, etc. until all backfill above the tank is in place.

3.20 LOCATION OF GAS LINES

A. The minimum horizontal clearance between gas pipe and parallel utility pipe shall be 2 feet. Do not install gas pipe through catch basins, vaults, manholes or similar underground structures.

3.21 FIELD QUALITY CONTROL

A. Before final acceptance of the work, test each system as in service to demonstrate compliance with the contract requirements. Perform the following tests in addition to the tests specified in the Plumbing Code, except as modified herein. Correct defects in the work provided by the Contractor, and repeat tests until work is in compliance with contract requirements. Furnish water, electricity, instruments, connecting devices, and personnel for performing tests. Before applying insulation, hydrostatically test each piping system at not less than 100 psig with any leakage or reduction in gage pressure for 2 hours.

B. Backflow preventers shall be tested by a locally approved and certified backflow assembly tester. A copy of the test report shall be provided to the Owner prior to placing the domestic water system into operation or no later than 5 days after the test.

END OF SECTION 15400

SECTION 15510 - HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES (SUBMITTAL REQUIRED FOR EACH ITEM)

A. Pipe and pipe fittings for:
   1. Heating water piping system.
   2. Chilled water piping system.
   3. Condenser water piping system.
   4. Equipment drains and overflows.

B. Valves:
   1. Gate valves.
   2. Ball valves.
   3. Plug valves.
   4. Check valves.

1.2 RELATED SECTIONS

A. Section 15010 - Mechanical General Requirements.

1.3 REFERENCES

A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brasing Operators.

B. ASME B16.3 - Malleable Iron Threaded Fittings Class 50 and 300.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

E. ASME B31.9 - Building Services Piping.

F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

G. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

H. ASTM B32 - Solder Metal.

I. ASTM B88 - Seamless Copper Water Tube.

J. ASTM D1785 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

K. ASTM D2241 - Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).

L. ASTM D2466 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

M. ASTM D2467 - Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

N. ASTM D2855 - Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

O. AWS D1.1 - Structural Welding Code.

P. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

Q. AWWA C110 - Ductile - Iron and Grey -Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

R. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.

S. AWWA C151 - Ductile-Iron Pipe,Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

T. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

U. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

V. MSS SP72 - Ball Valves with Flanged or Butt-welding Ends for General Service.

W. MSS SP80 - Bronze Gate, Globe, Angle and Check Valves.

X. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

Y. ASTM D3350 – Standard specification for Polyethylene Plastics Pipe and Fitting Materials.

Z. ASTM D3035 – Standard Specification for Polyethylene Plastic Pipe based on controlled Outside Diameter.

AA. AWWA C901 – Standard for Polyethylene Pressure Pipe and Tubing, ½ in. through 3 in.

BB. AWWA C908 – Standard for Polyethylene Pressure Pipe and Fittings, 4 in. through 63 in.

1.4 SUBMITTALS

A. Submit under provisions of Section 15010.

B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Welders Certificate: Include welders certification of compliance with ASME SEC 9. Submit copies of the welding procedure specifications and procedure qualification test results for each type of welding required. Submit this information on the forms printed in ASME BPVC SEC IX or their equivalent. Submit welders or welding operators names, together with certification of what the individual is performance qualified to perform. The certification shall state the type of welding and positions for which each is qualified, date qualified, and the firm and individual certifying the qualification tests.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 15010.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.6 QUALIFICATIONS

A. Manufacturer: Companies specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three years documented experience.

C. Welders: Certify in accordance with ASME SEC 9. The Welder shall have been certified within the last 12 months and welded continuously since being certified.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME SEC 9.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products delivered to site according to manufacturer's recommendations.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 HEATING WATER PIPING

A. Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and over, black.
   1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
   2. Joints: Threaded, or AWS D1.1,welded.
   3. The piping shall be threaded or welded up to 2", above 2" shall be welded.

B. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with

melting range 430 to 535 degrees F.

2.2 CHILLED OR CONDENSER WATER PIPING, BURIED

A. Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and over, black with AWWA C105 polyethylene jacket, or double layer, half-lapped 10 mil polyethylene tape.
1. Fittings: ASTM A234, forged steel welding type with double layer, half-lapped 10 mil polyethylene tape.
2. Joints: AWS D1.1, welded.
3. The piping shall be threaded or welded 2", above 2" shall be welded.

B. Copper Tubing: ASTM B88, Type K, annealed.
1. Fittings: ASME B16.22, wrought copper.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

C. Ductile Iron Pipe: AWWA C151.
1. Fittings: AWWA C110, ductile iron, standard thickness.
2. Joints: AWWA C111, rubber gasket with 3/4 inch diameter rods.

D. ~~PVC or~~**High Density Polyethylene (HDPE)** Pipe: ~~ASTM D1785, Schedule 40, and Schedule 80 for sizes 8 inch and larger, or ASTM D2241, SDR 21 or 26.~~ **ASTM D3035, ASTM D3350; AWWA C901 for sizes smaller than 4in., AWWA C906 for sizes 4in. and larger.**
~~1. Fittings: ASTM D2466, or ASTM D2467, PVC.~~
~~2. Joints: ASTM D2855, solvent weld.~~

2.3 CHILLED OR CONDENSER WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and over, black.
1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
2. Joints: Threaded or AWS D1.1 welded.
3. The piping shall be threaded or welded up to 2", above 2" shall be welded.

B. Copper Tubing: ASTM B88, Type L, hard drawn.
1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.4 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53, Schedule 40 galvanized.
   1. Fittings: Galvanized cast iron, or ASME B16.3 malleable iron.
   2. Joints: Threaded, or grooved mechanical couplings.

B. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

C. PVC Pipe: ASTM D1785, Schedule 40, and Schedule 80 for sizes 8 inch and larger, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: ASTM D2855, solvent weld.

2.5 PIPE HANGERS AND SUPPORTS

A. Conform to MSS SP58, MSS SP69 and MSS SP89.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Type-6, Malleable iron, adjustable swivel, split ring.

C. Hangers for Cold Pipe Sizes 2 Inches and Over: Type-1, Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Type-1, Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

H. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

I. Wall Support for Pipe Sizes 4 Inches and Over: Type-33, Welded steel bracket and wrought steel clamp.

J. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

K. Vertical Support: Type-42, Steel riser clamp.

L. Floor Support for Cold Pipe: Type-37, Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Floor Support for Hot Pipe Sizes to 4 Inches: Type-37, Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

N. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

O. Copper Pipe Support: Type-6, Carbon steel ring, adjustable, copper plated.

P. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

Q. Inserts: Type-18, Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.6 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:
1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:
1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick preformed neoprene.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 GATE VALVES

A. Up To and Including 2 Inches:
1. Bronze body, bronze trim, union bonnet, rising stem, handwheel, inside screw with backseating stem, solid wedge disc, solder or threaded ends, MSS SP-80.

B. Over 2 Inches:
1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and

yoke, solid wedge disc with bronze seat rings, flanged ends, AMSE B16.34.

2.8 BALL VALVES

A. Up To and Including 2 Inches:
1. Bronze two piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.

B. Over 2 Inches:
1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged, MSS SP-72.

2.9 PLUG VALVES

A. Up To and Including 2 Inches:
1. Bronze body, bronze tapered plug, full port opening, non-lubricated, teflon packing, threaded ends.
2. Operator: One plug valve wrench for every ten plug valves installed. A minimum of one shall be provided.

B. Over 2 Inches:
1. Cast iron body and plug, full port opening, pressure lubricated, teflon packing, flanged ends.
2. Operator: Provide each plug valve with a wrench with set screw.

2.10 SWING CHECK VALVES

A. Up To and Including 2 Inches:
1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder or threaded ends.

B. Over 2 Inches:
1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.11 SPRING LOADED CHECK VALVES

A. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body.

PART 3 EXECUTION

3.1 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Flanges, union, and couplings for servicing shall be provided.

B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

D. Provide pipe hangers and supports in accordance with MSS SP69 unless indicated otherwise.

E. Use gate, ball or as indicated valves for shut-off and to isolate equipment, part of systems, or vertical risers.

F. Use plug cocks for throttling service when calibrated valves are not required for balancing. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

G. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water, chilled water, condenser water, piping to ASME B31.9.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve all pipe passing through partitions, walls and floors.

G. Slope piping and provide for drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above recessed into and grouted flush with slab.

J. Pipe Hangers and Supports:
   1. Install in accordance with MSS SP89 or more stringent if required by specifications.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow. Hangars shall be placed adjacent to valves, strainers and other appurtenances in such a manner to support the load concentrations and to support the piping in the event components are removed during maintenance. Final arrangement and number of hangars will be as directed by the contracting officer.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. All exposed steel hangers and supports shall be painted with a prime cost then a finish coat with the color to match existing walls. Hangers and supports located in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

L. Provide access doors or panels any place valves are installed behind hard ceiling or walls.

M. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

O. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.

P. Install valves with stems upright or horizontal, not inverted.

Q. The piping system shall be flushed before being connected to the existing system. The flushing shall be performed at water velocities above 12 feet per second before the equipment is connected. Bypass piping shall be provided as required. The system shall be flushed until the discharge is completely clear.

R. The piping systems shall be tested at 1 ½ times the working pressure or 100 PSI which ever is higher. The system shall maintain the pressure for a minimum of **96** hours without any drop in pressure. After testing all gauges and equipment to do pressure test shall be removed and system checked for leaks at system pressure. **Testing of underground condenser water piping and geothermal well piping shall be performed after installation and any fill for the site has been added and compacted but before the building's concrete foundation is poured. Testing shall be witnessed by the engineer of record or representative of the firm. All pressure testing shall be using water, pressure testing using air shall be prohibited.**

S. The piping system shall be chemically cleaned then flushed and then the operating

chemical treatment provided as part of this contract.

T. All HDPE piping must be installed by a HDPE pipe heat fusion certified installer with a minimum 3 years experience.

3.4 SCHEDULES

A. Pipe Hanger Spacing.

1. Steel and copper shall be according to MSS SP-69.

2.

PVC PIPE SIZE Inches	HANGER ROD MAX. HANGER SPACING Feet
1/2 to 1-1/4	4.0
1-1/2 to 2	4.5
2-1/2 to 3	5.5
4 to 6	6.0
8 and over	8.0

3. HANGER ROD DIAMETER For 3/4" Thur 4"pipes 3/8" Rod
For 5" Thur 8"pipes ½" Rod
For 10" Thur 12"pipes 5/8" Rod
For 12" Thur 18"pipes 3/4" Rod

END OF SECTION 15510