

## SECTION 15400

### PLUMBING

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work Included - Perform the following items of work required to complete the work of this Section, as shown on the DRAWINGS and specified herein:
1. Furnish all labor, materials, equipment, transportation and perform all operations as required to install a complete plumbing system in accordance with these specifications and applicable DRAWINGS.
  2. The specifications and accompanying DRAWINGS do not indicate every detail of pipe, valves, fittings, hangers, equipment, etc., which are necessary for the complete installation but are provided to show the general arrangement and extent of work to be performed.
  3. The Plumbing Contractor shall check the Architectural and associated plans and specifications to assure proper coordination with the other trades. In the event of work being done on existing systems, the contractor is responsible for visiting the site before bidding to gain first hand knowledge of the systems. Any discrepancies found shall be reported to the Architect/Engineer prior to the bid.
- B. Related Work - The following related work is to be performed under the designated Sections.
1. Cutting and patching: By the respective trades or General Contractor.
  2. New sanitary sewers and manholes and new storm sewers and drywells: DIVISION 2, SITE WORK.
  3. New water mains and services: DIVISION 2, SITE WORK.
  4. Flashing for vents and roof drains at roof: DIVISION 7, ROOFING AND FLASHING.
  5. Service fittings for kitchen: DIVISION 11, FOOD SERVICE EQUIPMENT.
  6. Electric Work: DIVISION 16, ELECTRICAL.
  7. Ventilation and Heating work: SECTION 15600, HEATING AND VENTILATING.
  8. Temporary toilets: DIVISION 1, GENERAL AND SPECIAL CONDITIONS.
  9. Trenching and backfilling: DIVISION 2, SITE WORK.
  10. PART A, "Bidding Requirements, Contract Forms, and General Conditions", and DIVISION 1, "General Requirements", of PART B are hereby made a part of this SECTION.

##### 1.2 PERMITS

Apply for, obtain and pay for all permits and inspections required by law and notify proper authorities in ample time for such inspections to be made.

##### 1.3 QUALITY ASSURANCE

- A. Qualification of Workmen  
Use sufficient journeyman plumbers and competent supervisors in the execution of this portion of the work to ensure proper and adequate installation of plumbing throughout.
- B. Codes  
Work performed by this Contractor shall conform to the current State of Maine Plumbing Code and latest amendments, the applicable Building Officials Code Administrators (BOCA) Plumbing Code and the ASHRAE Energy Code. These codes are considered a part of these specifications.

##### 1.4 SUBMITTALS

- A. **Shop Drawings**  
Before any plumbing materials are purchased or released for production, submit to the Architect/Engineer 6 copies of complete shop drawings in accordance with the provisions of the GENERAL CONDITIONS AND SUPPLEMENTARY CONDITIONS of these specifications, clearly marked to show all the plumbing materials proposed to be furnished and installed. Shop drawings shall be submitted in suitable binders with project and contractors' names clearly labeled.
- B. **Record Drawings**  
During progress of the Work, maintain an accurate record of all changes made in the plumbing system installation from the layout and materials shown on the DRAWINGS or specified. At the completion of the project, transfer all information onto a set of new blue-line prints and furnish to the Architect/Engineer for final "as built" revisions.
- C. **Manual**  
Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Architect/Engineer for the Owner two copies of a Manual describing the system. Prepare manuals in durable plastic binders approximately 8½ x 11" in size with the following:
  - 1. Identification on, or readable through, the front cover stating general nature of the manual.
  - 2. Copy of all approved submittals and shop drawings.
  - 3. Complete instructions regarding operation and maintenance of all equipment involved.
  - 4. Copy of all guarantees and warranties issued.
  - 5. Where contents of manuals include manufacturers' catalog pages, clearly indicate the precise items included in this installation.

#### 1.5 PRODUCT HANDLING

- A. Protect plumbing materials before, during and after installation and protect the installed work and materials of all other trades.
- B. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

#### 1.6 MATERIALS

- A. All materials and equipment, as shown on DRAWINGS, shall be new and of the latest design of the respective manufacturers. All material and equipment of the same classification shall be the product of the same manufacturer unless otherwise specified.

#### 1.7 SUBSTITUTIONS

- A. Any proposal for substitution shall be made in writing by the Contractor, who shall submit full details for consideration, including cost savings, and obtain written approval of the Architect/Engineer.
- B. Approval by the Architect/Engineer for such substitution shall not relieve the Contractor from his responsibility regarding a satisfactory installation of such work in accordance with the intent of the plans and specifications and shall not affect his guarantee covering all parts of the work.
- C. Any material or equipment submitted for approval which is arranged differently or of a different physical size from that shown or specified shall be accompanied by shop drawings indicating the different arrangements of size and the method of making the various connections to the equipment. The final results shall be compatible with the system as designed.
- D. Any additional cost resulting from the substitution of equipment shall be paid by the Contractor.

- E. Any cost savings resulting from the substitution shall be deducted from the contract amount.

## 1.8 INSURANCE

- A. The Contractor shall purchase and maintain all Workers' Compensation Insurance, Public Liability and Property Damage Insurance during the progress of the Work and until completion and acceptance of the entire project by the Owner in the amounts as specified in the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

## 1.9 SAFETY REGULATIONS

- A. All work shall be performed and/or installed to conform to all requirements of the Occupational Safety and Health Act of 1970 and all amendments thereto.

## 1.10 GUARANTEE

- A. Guarantee all materials and workmanship furnished by this Contractor or his Sub-contractors to be free from all defects for a period of one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner.

## 1.11 ASBESTOS

- A. The owner shall be responsible for all of the following asbestos related activities as may be required including: site surveys, sampling, testing, removal specifications and removal. Following the satisfactory completion of the asbestos removal, the owner shall notify the Contractor of same.
- B. The Mechanical Contractor shall not begin any work as described within this section of the specifications until receiving written notification from the owner as indicated.

## 1.12 DEMOLITION

- A. The plumbing contractor shall be responsible for removal and/or relocation of existing fixtures and equipment and the removal and/or capping of associated waste, vent, hot, cold and gas lines. Removed equipment shall be turned over to the owner or properly disposed of by the contractor as directed by the owner.

## PART 2 - PRODUCTS

### 2.1 PIPE

- A. Sanitary Soil, Waste, Vents, and Roof Drainage (Choice of following)
  1. Service weight cast iron soil pipe and fittings with B&S "push-on" gasket joints or hubless "No-Hub" sleeve couplings CISPI Standard 301-72.
  2. Schedule 40 polyvinyl-chloride "PVC-DWV" pipe and solvent cemented socket drainage fittings.
    - a. Vents through roof shall be black "ABS-DWV" pipe.
  3. Roof drain in stairwell shall be cast iron as noted on the plans.
  4. Drain from boiler blowdown tank type "L" copper
- B. Domestic Water Piping

1. All hot, cold and recirculation water piping shall be harddrawn copper tube with wrought or cast brass copper fittings and made up with 95-5 tin antimony solder.
2. Below grade and below slab piping shall be type "K" soft temper; all other copper piping shall be type "L".
3. Lead solder or flux with more than .2% lead content is prohibited.

C. Site Water Piping (Sprinkler and Domestic Water)

1. Cast iron (ductile iron) water pipe per ASTM A 377; AWWA C151 suitable for a minimum working pressure of 160 psi.

## 2.2 NATURAL GAS PIPING SYSTEM

A. General

1. Provide and erect in accordance with the best practice of the trade all gas piping as required to complete the intended installation. The Contractor shall make such offsets as are required to place all piping in proper position to avoid other work.
2. Install a sufficient number of flanged fittings or unions to facilitate assembly and disassembly of piping and removal of equipment.
3. All steel pipe mains 2½" and larger and concealed piping in chases and walls regardless of size shall have welded connections, using standard factory-fabricated tees, elbows, reducers, caps, etc. Branch outlets in welded sizes shall be made with tees for full size or one size reduction and with either "Weldolets" and "Threadolets" or factory shaped nipples for all other sizes. All welds shall be made by qualified welders. All welds shall conform with the rules set forth in the Standard Manual on Pipe Welding of the Heating, Piping, and Air Conditioning Contractors National Association.
4. Steel piping 2" and smaller (except concealed piping in chases and walls), shall have screwed connections. All threads on piping must be full length and clean-cut with inside edges reamed smooth to the full inside bore. Close nipples shall not be used without specific approval of the Construction Manager.
5. Piping runouts to equipment shall include a union, 6" long drip leg with cap and a quarter turn square head shutoff cock.
6. Piping should be pressure tested at 10 psi with compressed air. System shall maintain pressure for a minimum of two (2) hours.
7. Entire installation shall conform to NFPA.

B. Related Work

1. Fuel supplier shall furnish meter, pressure reducing valve site piping and isolation valves as required.

C. Pipe Materials

1. Gas - Schedule 40 standard weight black steel ASTM A-120 and A-53.

D. Pipe Fittings

1. Screwed - 125# cast or malleable iron screwed pattern ANSI B16.1.
2. Unions - 250# malleable iron with brass to iron ground seats.
3. Flanges - 150# forged steel slip-on ANSI B16.5.
4. Connections to Equipment - 2" smaller screwed unions, 2½" and larger flanged.
5. Welded - Standard weight butt well carbon steel ASTM A-234 from A106 Grd. B. seamless tube.

E. Jointing

1. Screwed - Use suitable pipe joint compound or tape suitable for natural gas.

F. Gas Cocks

1. All valves shall be AGA certified and UL listed.
2. Gas Cocks 2" and Smaller: 150 psi non-shock WOG, bronze straightway cock, flat or square head, threaded ends.
3. Gas Cocks 2½" and Larger: 125 psi non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.

### 2.3 VALVES

- A. All valves shall be of one manufacturer and as manufactured by Nibco, Hammond or approved equal.
  1. Gate Valves - Shall be 125# WSP bronze, soldered ends, Nibco S-121 Disc, Jenkins 1242, Crane 1334.
  2. Globe Valves - 2" and under shall be 125# WSP bronze, solder ends, with renewable composition disc, Nibco S-235 (Y) Crane 1310.
  3. Check Valves - 300# WOG bronze swing check, regrinding bronze disc, screw-in cap, Nibco S-413 (BWY), Jenkins 1222, Crane 1342.
  4. Drain Valves - Shall be 125# WSP hose-end boiler drains. Nibco No. 72 or equivalent.
  5. Hose Bibbs (Interior) - Chrome plated solid flange compression faucets with loose keys and male hose ends, Nibco #663, Kohler #K-8980, Wolverine #664-½. Provide a non-removable backflow preventer on each faucet hose end. Watts No. 8A or equal.
  6. Frost-proof Sillcock - Red bronze body with heavy nickel plated finish, brass-rod stem with Teflon impregnated asbestos packing, Buna-N seat disc, ¾" Nibco 80-VB with lockshield and Aluminal Lockshield handwheel. Provide chamber length as required by wall construction.
  7. Ball Valves - Acceptable in lieu of gate and globe valves, in sizes ½" to 2". 400 lb. WOG bronze body, screwed or solder ends, bronze ball, Buna stem seals, Buna-N or equal resilient seats, lever handle. Equal to Nibco T-580.

### 2.4 PIPE SLEEVES AND ESCUTCHEONS

- A. Sleeves
  1. Contractor shall set sleeves for all piping penetrating walls, partitions and floors, Sleeves through masonry shall be steel pipe sleeves two (2) sizes larger than the pipe. Pipe passing through non-rated walls or partitions other than masonry shall be provided with PVC or #24 gauge galvanized steel tubes with wired or hemmed edges.
  2. Sleeves set in partitions shall finish flush with the underside but extend a minimum of 1" above the finish floor.
  3. Spaces between sleeves and pipes shall be caulked with oakum packing and elastic cement (coal tar or asphalt compound on exterior walls) to make smoke and water tight.
  4. For metal pipes or ducts passing through smoke or fire rated walls or floors caulk with 3M CP25WB.
  5. For plastic pipes passing through smoke or fire rated walls or floors use 3M FS-195 wrap/strip with putty smoke sealants and intumescence. Device shall be UL classified for two (2) hour rating.
- B. Escutcheons
  1. Where piping passes through finish walls, floors, ceilings and partitions, provide and set two-piece nickel plated steel floor and ceiling plates.

### 2.5 HANGERS AND SUPPORTS

- A. General

1. All hangers and supports shall be specially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.
2. Piping specified herein shall not be supported from piping or equipment of other trades.
3. Hangers shall be heavy duty steel adjustable band type; plain for steel and cast iron pipe, and copper plated for copper tubing.
4. Exposed vertical risers 3/4" and smaller shall be supported at the mid-point between each floor with split-ring type hangers; copper plated for copper tubing.
5. Provide insulation saddles for all cold water and roof leader piping.

B. Hanger Rods

1. Hanger rods shall be all-thread rod in concealed areas, and rods threaded on ends of rod only in finished areas and the Boiler Room. Rod size shall be 3/8" for piping 2" and under; 1/2" for 2 1/2" to 6"; 5/8" over 6".
2. Provide lag points with rod couplings for fastening to wood, toggle bolts in concrete blocks or structural slabs and compound anchor shields and bolts in poured concrete.
3. Supports: Provide structural iron supports, as required.

2.6 SHOCK ABSORBERS

- A. All piping shall be protected from water hammer or shock by approved shock absorbing devices. Shock protection shall be provided for each fixture or supply branch up to 20 ft. in accordance with "Standard P.D.I.-WH201". Units to be as manufactured by Smith, Josam or Zurn, or Amtrol, Inc.

2.7 WALL HYDRANTS (EXTERIOR)

- A. Units to be anti-siphon non-freeze 3/4" bronze wall hydrants, complete with integral backflow preventer, removable seats, union and operating key. Polished bronze face plate. Units to be equal to Zurn Z-1310 or Josam 71050. Provide each hydrant with a service gate valve and install in accessible location.

2.8 CLEANOUTS

- A. Provide cleanouts for soil, waste and storm piping at base of all stacks, where shown on the DRAWINGS and as required by code.
1. Floor Cleanouts
    - a. All floor cleanouts shall be flush with floor, round adjustable tops, bronze plug and lead seal, scoriated secured nickel bronze top, flashing flange with flashing device, inside caulk. Units shall be Josam 58000(-25) (-41); Smith Fig. 4026F-C or equal by Zurn or Wade. Cleanouts shall be brought up to finished floor to facilitate usage.
  2. Wall Cleanouts
    - a. All wall cleanouts shall be "T" fittings with bronze slotted plug with lead seal, stainless steel wall cover; Josam 58790 Smith Fig. 4531 or 4551 or equal by Zurn or Wade. Cleanouts in piping chases shall be extended to finished wall to facilitate usage.

2.9 FLOOR DRAINS

- A. All floor drains shall be complete and each provided with flashing device, and P-trap in outlet except as noted without trap. Drain outlet and trap to be same size as branch waste pipe.
1. Type "A"
 

Cast iron body, flashing collar, nickel-bronze, 6" diameter adjustable strainer head, no hub. Smith 2005-A, Zurn or Josam.

2. Provide Proset elastomer sleeve closure device, "Trap Guard", to prevent sewer gas emissions and trap evaporation. Guard allows flow rates of up to 30 GPM and is installed within floor drains or indirect waste piping inlet. Guards shall be installed in floor drains in the boiler room and in the indirect waste from the elevator sump pump.

#### 2.10 PRESSURE GAUGES

- A. Furnish and install a pressure gauge at the water service entrance and elsewhere as indicated on the DRAWINGS.
- B. Gauges to be phosphor-bronze bourdon tube dial type with 3½" stainless steel case, glass window, white face, black markings, brass movement, brass socket, with 1% accuracy at mid-scale, and 0 to 160 psig range. Equal to Trerice No. 800, Weiss TL-P or Moeller x16x07.
- C. Schedule
  1. Water Service: 0-160 psig

#### 2.11 THERMOMETERS

- A. Furnish and install thermometers at the water heater outlets and elsewhere as indicated on the DRAWINGS. Thermometers to be bi-metal, adjustable angle dial type with 3" stainless steel case and glass window. Provide each unit with a brass separable socket. All thermometers shall be provided with stems long enough to get a true reading of the water temperatures and set in a location to be visible. Thermometers to be as manufactured by Trerice, Weiss or Moeller. Equal to Trerice B-83600.
- B. Schedule
  1. DHW Heater: 0-180°F

#### 2.12 BACKFLOW PREVENTION

- A. General

Backflow preventers shall be installed at any cross connection to prevent the backflow of contaminated water into the potable water supply in accordance with the local and state plumbing codes. Units shall be of bronze construction with bronze strainer and stainless steel internal parts and tight seating rubber check valve assemblies. The device (specified or indicated on the plans) shall meet the requirements of A.S.S.E. Standard 1013.
- B. Reduced Pressure Zone Type

A reduced pressure backflow preventer shall be a complete assembly including tight-closing shut-off valves before and after the device and also be protected by a strainer. The design shall include test cocks, a pressure-differential relief valve located between two positive seating check valves. The device, (specified or indicated on plans) shall meet the requirements of A.S.S.E. Standard 1013 and AWWA-C511-92. It shall be suitable for supply pressure up to 175 psi and temperatures up to 140°F, Watts Regulator Company 909, Febco 825Y or Wilkens 575.
- C. Double Check Valve Type
  1. ½ and ¾" sizes

Watts No.9D backflow preventer with intermediate atmospheric vent shall be used to prevent flow of polluted water into the potable water system. Unit shall be suitable for supply pressures up to 175 psi and supply temperatures up to 210°F constant and 250°F intermittent. The device shall meet the requirements of ASSE standard 1012. Unit may be installed vertically or horizontally and is suitable for use under continuous pressure, Febco 815.
  2. ¾" and larger

Watts No. 007/700 has bronze body construction and is standardly equipped with a

strainer, gate valves and ball type test cocks that may be installed either horizontally or vertically. Sizes: 3/4", 1", 1½" and 2". The device shall meet the requirements of ASSE standard 1015 and AWWA - C510-92. Suitable for supply pressures up to 175 lbs. and for supply water temperatures up to 140°F. Febco 805, Wilkens 550.

D. Vacuum Breakers

1. Pressure Type Vacuum Breakers  
Watts No. 800 are suitable for working temperatures from 33°F. to 210°F. and pressures from 15 psi to 150 psi. Unit includes test cocks and tight seating gate valves. Units are suitable for continuous supply pressure.
2. Atmospheric Vacuum Breakers  
Watts No. 288A are suitable for working pressures up to 125 psi and maximum temperatures to 210°F. Unit No. 8 series shall be used to prevent backflow of polluted water at hose connections.

E. Schedule

1. Water Boiler make-up water - 3/4" RPZ series 900.
2. All hose bibbs and service sinks - Type 8A.
3. All laboratory faucets - Type N-LF9.
4. Water entrance - Series RPZ 900.
5. Water Side of steam/hot water heat exchanger - 3/4" RPZ Series 900.
6. Steam Boiler feed tank make-up water - 3/4" RPZ Series 900

2.13 HOT WATER STORAGE TANK/HEATER (HTR-1)

- A. Storage heater shall be Cemline Series SWH; factory assembled and packaged. Water heater shall be constructed in accordance with ASME Code for a working pressure of 150 psig. The packaged water heater shall be constructed with a horizontal steel tank, cement lined with an 12" x 16" manhole, with stainless threaded opening, 3/4" O.D. double walled Copper tubes, copper lined tube sheet, and steel or cast iron coil head.
- B. Heater shall be mounted on a steel support skid and shall have concealed lifting lugs. Heater shall be insulated with 3" Fiberglass protected by an enameled metal jacket, 20 gauge minimum thickness, with access panel to the manhole. Heater shall be factory assembled and piped . Temperature shall be controlled by cycling a pump, no control valve is required. Coil shall have copper wrapper, shall be baffled and shall have an integral valved circulator to circulate the water across the coil into the bottom of the tank.
- C. Heater shall be provided with a field programmable digital electronic limit control with LCD readout and digital thermometer.
- D. Heater shall be furnished with a water pressure gauge and an A.S.M.E. pressure-temperature relief valve of sufficient size to relieve total BTU input of the coil.
- E. Manufacturer shall assume responsibility for correct sizing of components to assure performance designated in design criteria.
- F. Heater shall be CEMLINE Corporation Model H1000SWH654-DW or equal.  
Tank dimensions 60" diameter x 96" long.  
Storage gallon capacity 1000 .  
Coil to heat 600 GPH from 40 /F to 140 /F with 50.48 GPM of 180 /F inlet - 160 /F outlet Hot Water.

2.14 HOT WATER CIRCULATORS

- A. Circulators

1. Provide and install all bronze, corrosion proof, in-line circulating pumps in hot water re-circulating lines with capacity as shown on the DRAWINGS. Each unit motor to be provided with internal overload protection.
2. Circulators to be Bell & Gossett Booster, Taco, Thrush, or approved equal.

B. Controls

1. Provide Hand-Off-Auto switch. In the occupied mode pump shall be cycled through a 7 day 24 hour time clock. Pumps shall run continuously from 6:00 AM to 9:00 PM.

2.15 ELEVATOR PIT SUMP PUMP

A. Pump

1. Submersible centrifugal type, with cast iron casing, 2" discharge, stainless steel shaft, bronze fitted construction, mechanical seals and perforated steel strainer. Pump shall be Model SE-50 by Stancor or equal.
2. Ball bearing motor designed for operation while totally submerged in water, built-in thermal overload protection, ½ HP, 120 volt, single phase 3600 RPM.
3. Self-contained diaphragm operated control switch, 10ft. long waterproof grounding type electric power cable with "Twist-lock" plug and receptacle.
4. Pump capacity to be not less than 20 GPM at 30ft. TDH.

B. Controls

1. Stancor "Oil-Minder" controls suitable for 115 volt with built in audible and visual alarm when pump does not run due to oil in the pit, high amperage, or high liquid level condition. Control panel shall include a single direct plug-in power source, silencing button, multi-pin connector and multi-pin connector cord in conduit in 25' increments. Panel shall be factory wired and have a NEMA 4x weathertight corrosion resistant enclosure with contact for remote alarm location.
2. Provide junction box with multi-pin connector.
3. Provide "Oil-Minder" stainless steel oil sensor probe, power cable, oil probe cable and float control cable.
4. System shall be built to UL508 and UL778 standards.
5. Provide high liquid level float with clamp device to mount to discharge piping.
6. Float controls shall cycle pump based on liquid level in the sump as long as oil is not detected. If oil is detected the pump shall be shut off and local alarms activated.

C. Accessories

1. Provide gate valve and check valve in each discharge pipe and a union. Extend discharge piping as shown on DRAWING.

2.16 MIXING VALVES

A. EMERGENCY SHOWER MIXING VALVE (MV-2)

The Emergency Shower Mixing Valve shall control the temperature of the water to drench or combination station and shall maintain a constant temperature within + 5°F. Unit shall be self contained and include a primary and a secondary thermostatic water mixing valve, a dial thermometer on the outlet, union angle strainer checkstops, wall mounting bracket, piping and fittings factory assembled and tested, top inlets and outlet, unit set for 80°F and a maximum temperature of 90°F. Unit must be able to be set to the correct temperature for the specific contaminant but must be locked in place to prevent changing of the temperature by accident. Unit must be checked weekly for performance in conjunction with the requirements of ANSI Z-358. Unit shall be able to flow a minimum as scheduled on the plans. Unit will maintain temperatures within the acceptable range to a minimum flow of 2 GPM. Valve shall be manufactured by Leonard, Powers, Symmons or equal.

WARNING! IT IS THE RESPONSIBILITY OF THE OWNER TO DETERMINE THE DELIVERED WATER TEMPERATURE TO EACH SAFETY FIXTURE. A COMFORTABLE RANGE IS 60°F TO 90°F. IN CIRCUMSTANCES WHERE A CHEMICAL REACTION IS ACCELERATED BY WATER TEMPERATURE, A MEDICAL ADVISOR SHOULD BE CONSULTED FOR THE OPTIMUM TEMPERATURE FOR EACH APPLICATION.

The owner shall maintain a current list of all chemicals used and shall obtain safe operating temperature range for Emergency Showers from chemical supplier. For each chemical. Mixing valve discharge temperature shall then be set and locked at the appropriate temperature.

B. WATER TEMPERATURE CONTROLLERS (MV-1)

Bronze body High-Low thermostatic water temperature controller, factory assembled, with manual adjustment stop limits, inlet manifold, pressure regulating valve and check stops. Volume control shut off valve, bimetal dial thermometer (3" face, range 0° - 140° F), brass pipe, fittings and unions.

1. Provide approved bracket for wall mounting. Mount at height as noted on the plans.
2. Thermostatic valves shall maintain water temperature within 5°F. of any setting at all times including during an 85 percent restriction in rated delivery or a 75% drop in inlet pressures, and shall "fail safe" on failure of either hot or cold supplies or thermostat motor.
3. Capacity - As noted on the plans.
4. Makes - Leonard, Powers, Symmons or equal.

2.17 INSULATION

A. General

1. Insulation shall be provided for cold and hot water piping except immediate connections to fixtures. Insulation systems shall have a flame spread rating of 25 or less and a smoke developed and fuel contributed rating of 50 or less. Items to be insulated include:
  - a. Cold water lines.
  - b. Hot water (140, 115 & 85°F) lines.
  - c. Roof leaders.
  - d. Hot water recirculation lines
2. Minimum Fiberglass Pipe Insulation (IN)

	Runouts	1" & Less	1 1/4" & More
DHW (105°F+)	0.5	1"	1 1/2"
		2" & Less	2 1/2" & More
DCW	0.5	1"	1 1/2"

B. Cold Water

Insulate all cold water piping above grade with fiberglass heavy density sectional pipe insulation system having a factory applied vapor barrier laminate all-service jacket. Entire insulation jacket lap, butt closure strips, exposed butt ends, and fitting covers to be sealed with white vapor barrier adhesive. Provide additional sealing of jacket with flare type staples to eliminate "fishmouths". Staples shall not penetrate more than 1/2 the insulation thickness.

C. Hot Water

Insulate all hot water and hot circulation piping with fiberglass heavy density sectional pipe insulation system with all-service jacket. Longitudinal jacket flaps to be secured with flare type staples To eliminate "fishmouths". Cut insulation to include hangers.

D. Roof Leaders and Roof Drains

Insulate all rain water conductor lines above floor with 1" thick insulation as specified for cold water above. Provide insulation saddles for all hangers.

E. Fittings

1. All fittings shall be wrapped with fiberglass insulation and covered with a one-piece PVC insulated fitting cover secured with flare type staples. Cover joints with 4" insulation straps over.
2. Finish ends of insulation on exposed pipes at valves, flanges, unions, etc., with covering to match jacket and secured with mastic.
3. Valves, flanges and unions shall not be insulated.

F. Piping Below Handicapped Lavatories and Sinks

Handicapped lavatory P-Trap and angle valve assemblies shall be insulated with the fully molded, Truebro, Handi Lav-Guard insulation kit, Model #102, light gray color with three-piece interlocking trap assembly and two-piece interlocking angle valve assemblies. Fasteners shall be nylon-type supplied with kit.

G. Installation

All insulation work shall be executed by skilled insulation workmen regularly employed in the trade.

2.18 ELECTRIC MOTOR EFFICIENCY RATINGS

All motors 1/3 HP and smaller shall be wired for 120 volt, 1 phase, 60 hz; motors 1/2 HP and larger shall be wired for 3 phase, 60 hz, unless specifically shown otherwise. All integral horsepower motors shall be efficiency type, and have no less than the following efficiency:

Table I  
Minimum Motor Efficiency  
Minimum Guaranteed Efficiency (%)

Hp	Open Motor Efficiency	Enclosed Motor Efficiency
1	82.5	82.5
1.5 - 2	84	84
3	86.5	87.5
5	87.5	87.5
7.5	88.5	89.5
10	89.5	89.5
15 - 20	91	91
25	91.7	92.4
30	92.4	92.4
40 - 50	93	93
60	93.6	93.6
75	94.1	94.1
100	94.1	94.5
125	94.5	94.5

2.19 PLUMBING FIXTURES AND EQUIPMENT

A. General

1. Furnish and install all plumbing fixtures shown on the Drawings and as hereinafter Scheduled.
2. To establish a standard of quality and design desired, specifications have been based generally on the use of Kohler Company fixtures; Elkay sinks and Sloan flush valves. An equal type and quality of fixture as manufactured by American Standard or Eljer Company or flush valve by Coyne and Delaney or of stainless steel sinks by just is acceptable.
3. All fixtures are to be white vitreous china where not otherwise specified. All fittings are to have chromium finish.

B. Fixtures

1. Water Closets

- a. Type P-1A (Floor Mount Suitable for Handicapped)  
Fixture: K-4368 Highcliff Lite vitreous china siphon jet elongated toilet with 2-1/4" passage and 1½" top spud. 1.6 gal flush.  
Trim: K-4670-C Lustra solid plastic open front seat with check hinge.  
Valve: Refer to electronic control section.  
Seat: K-4670-C Lustra, solid plastic, open front seat with check hinge.

- b. Type P-1B (Wall Mount Suitable for Handicapped)  
Fixture: K-4330 Kingston Lite vitreous china, siphon jet, elongated toilet with 2 5/8" passageway and 1½" top spud mounted at 18" suitable for handicapped. 1.6 gal flush.  
Carrier: Supporting adjustable chair carrier equal to Zurn 1200 series including:  
Z-1209 for first floor women's toilet (rotate rear anchor to accommodate limited space restrictions)  
Z-1203-N4 for horizontal piping, single unit  
Z-1203-ND4 for horizontal piping, back to back units  
Z-1204-2-N4 vertical unit with horizontal connections  
Valve: Refer to electronic control section  
Seat: K-4670-C Lustra, solid plastic, open front seat with check hinge.

- c. Type P-1C (Wall Mount Standard Height)  
Fixture: K-4330 Kingston Lite vitreous china, siphon jet, elongated toilet with 2 5/8" passageway and 1½" top spud mounted at 15" suitable for handicapped. 1.6 gal flush.  
Carrier: Supporting adjustable chair carrier equal to Zurn 1200 series including:  
Z-1209 for first floor women's toilet (rotate rear anchor to accommodate limited space restrictions)  
Z-1203-N4 for horizontal piping, single unit  
Z-1203-ND4 for horizontal piping, back to back units  
Z-1204-2-N4 vertical unit with horizontal connections  
Valve: Refer to electronic control section  
Seat: K-4670-C Lustra, solid plastic, open front seat with check hinge.

2. Urinals

- a. Type P-2A (H.C. Urinal)  
Fixture: K-5016-ET Dexter water guard urinal, vitreous china. Compact space saving siphon jet design, 3/4" top spud inlet, 2" I.P.S. outlet and wall bolts. 1 gal flush.  
Height: 20-3/8"

- Width: 13½"  
Wall to Front of Flare: 14½"  
Valve: Refer to electronic control section
- b. Type P-2B (Standard Wall Urinal)  
Fixture: K-4960-ET Bardon water-guard vitreous china washout action urinal with 3/4" top spud inlet, 2" I.P.S. outlet, wall hangers and removable beehive strainer.  
Valve: Refer to electronic control section
3. Lavatories
- a. Type P-3A (Wall Lavatory Suitable for Handicapped)  
Fixture: K-2032 Greenwich 20" x 18" vitreous china wall mounted lavatory with 4" faucet centers. Drilled for concealed arm carrier.  
Trim: K-15597 Coralais single lever, 4-1/4" reach, 4" height, high limit stop, drain grid, spout, vandal resistant .5 gpm aerator and drain with 1-1/4" tailpiece.  
Supplies: K-13711 3/8" I.P.S. supplies with loose key stops.  
Trap: K-8998 1 1/4" cast brass "P" trap.  
Support: Model 0700-M31, floor mounted lavatory supports with concealed arms.
4. Sinks
- a. Type P-4A (Mop Receptors)  
Receptor: Pre-cast "molded-stone" basin composed of finely ground natural stone, resins, and reinforcing fibers molded into shape under heat and pressure in metal forms. Color - beige drift.  
Sizes: 24" x 24" x 10" high or as scheduled.  
Waste: Cast brass drain body clamped to receptor with locknut and neoprene gasket. Stainless steel dome strainer with lint basket. Drain body designed for 3" inside caulk drain pipe connection.  
Makes: Fiat/Powers "MSB", Cutler, Elsmere or approved equal.  
Installation: Seal all spaces between floor or walls and receptor with approved white silicone-rubber sealant. (Fiat 833AA)  
Trim &  
Accessories: Combination hose end faucet, vacuum breaker, integral stops, bucket hook, top brace. (Fiat 830-AA), b) 30" long heavy duty flexible reinforced rubber hose with wall bracket (Fiat 832-AA).
- b. Type P-4B (Lab Sink)  
Sink: Furnished by lab equipment supplier  
Trim: Faucets and gas cocks by lab equipment supplier  
Supplies: Provide H, C and gas supplies with stops  
Strainer: LK-35.  
Trap: Provide trap and W and V piping
- Type P-4B HC (Lab Sink)  
Sink: Furnished by lab equipment supplier  
Trim: Faucets and gas cocks by lab equipment supplier  
Supplies: Provide H, C and gas supplies with stops and insulation suitable for Handicapped Access  
Strainer: LK-35.  
Trap: Provide trap and W and V piping and insulation suitable for Handicapped Access
- c. Type P-4C (Single Compartment Sink)

- Sink: LR-2522 18 gauge, type 302, self-rim stainless steel sink.  
Overall size: 25" x 22". Bowl size:  
21" x 15 3/4" 8".
- Trim: LK-230 Two handle concealed-mount 8" cast swing spout and  
2.0 gpm aerator with wing handles.
- Strainer: LK-35
- d. Type P-4D (Floor Mounted Steel Sink)  
Fixture: Just NSF148 single compartment welded sink constructed of  
14 gauge Type 304 stainless steel with polished satin finish, 8"  
backsplash and 4 tubular legs. Compartment size: 48" x 24" x  
12".  
Trim: JS-48-TA1, 8-inch swing spout and mixing faucet.  
Strainer: JS-35-BLA-2".  
Trap: JT-200
5. Showers
- a. Type P-5A (36"x36" ADA Transfer Shower)  
Shower: 36" x 36" built-up shower by General Contractor.  
Unit to be installed so that threshold height meets ADA and  
local code. Shower controls to be located opposite seat.  
Trim: Pressure balancing shower mixing valve with temperature limit  
Stop, integral angle stops, escutcheon, lever handle, brass  
diverter type, adjustable spray shower head with 2 GPM flow  
restrictor, wall/hand held shower with flexible hose, Symmons  
No. 96-500-X-2-B30.  
Waste: Floor drain specified in paragraph 2.9.
- b. Type P-4B (36"x36" Shower)  
Shower: 36" x 36" built-up shower by General Contractor.  
Trim: Pressure balancing shower mixing valve with temperature limit  
Stop, integral angle stops, escutcheon, lever handle,  
adjustable spray shower head with 2 GPM flow restrictor,  
Symmons No.S- 96-1-131-X-2.  
Waste: Floor drain specified in paragraph 2.9.
6. Safety Fixture/Station
- a. Type P-6A (Emergency Shower and Eyewash Station)  
Guardian safety station shower and eye wash combination, model G1900, with  
free standing drench shower, 1" slow self closing shower valve, hand operated  
pull chain unit with two soft stream heads, 1/2" stay-open ball valve and  
stainless steel bowl, floor flange and intermediate piping. Unit shall include 1-  
1/4" outlet and 1-1/4" inlet with all necessary mounting hardware.
7. Electric Water Coolers
- a. Type P-7A & 7B (Barrier-Free Bi Level Water Coolers)  
Each shall deliver 8.0 GPH of 50° water at 90° ambient and 80° inlet water. Shall  
have horizontal stainless steel top with removable drain strainer. Projector shall  
be two-stream, mound-building type. Separate valve and diaphragm automatic  
stream regulator shall be mounted within cabinet. Refrigeration system shall  
employ high efficiency, positive start compressor using R134A, non-pressurized  
tank with totally encapsulated insulation and be controlled by positive sensing  
thermostat. Shall have front pushbar water controls with chrome-plated raised  
lettering for the visually impaired. Cooler shall comply with ANSI 117.1 and  
ADA for both visual and motion disabilities. Cabinet shall have removable front  
panels. The manufacturer shall certify the unit to be lead-free as defined by the  
Safe Drinking Water Act.

1. Energy consumption not to exceed 500 watts/hr. Shall be certified by ARI to meet Standard 1010-94. Cooler shall be Halsey Taylor Model HAC8FSBL-Q.
  2. Each unit shall be furnished with plug-in, 3-wire grounding type service cord suitable for 15amps, 115volts.
8. Whirlpool Hydrotherapy Control Unit
- a. P-8 (Wall Mounted Whirlpool Hydrotherapy Control Unit)  
Leonard Model TM-356-10-W/HA  
½" inlets, ½" outlet, 1 to 7 GPM  
Combination checkstops, unions on inlets, wall support and dial thermometer  
9 feet of 3/8" rubber hose and spray  
Extra hose attachment  
Chrome plated finish
9. Fixtures and Equipment by Others:
- a. Lab equipment will be provided and set by the General Contractor. Plumbing contractor shall provide traps in wastes and stop valves on hot and cold water and gas supplies to each fixture, and to install trim and accessories furnished by others. Plumbing contractor shall provide traps in wastes and stop valves on hot and cold water supplies to dishwasher and ice machine.

## 2.20 ELECTRONIC CONTROLS

- A. All flush valve water closets and urinals shall have "Optima" electronic controls by Sloan.
  1. Water closets Model 111-ESS-S
  2. Urinals Model 186-1-ESS
- B. Water closet flow 1.6 gpf, urinal flow 1 gpf
- C. Provide EL-154 transformers (120 V). Mount transformers above ceiling over men's and women's toilet rooms. Provide one for toilet room 015, one for 020, one for E138 and two for E154.
- D. Provide sensors, solenoid operators, wall plates, extension nipples and transformers
- E. System shall be 24 volt.
- F. Mechanical Contractor shall be responsible for wiring.

## PART 3 - EXECUTION

### 3.1 SURFACE CONDITIONS

- A. Inspection
  1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
  2. Verify that plumbing can be installed in strict accordance with all pertinent codes and regulations and the approved Shop Drawings.
- B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect/Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 3.2 INSTALLATION OF PIPING AND EQUIPMENT

#### A. General

1. Install all piping promptly, capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of 1/4" per foot wherever possible but never less than 1/8" per foot or as shown on DRAWINGS for all horizontal waste and drainage piping within the building; pitch all vents for proper drainage; install vent piping with each bend 45° minimum from the horizontal wherever structural conditions will permit.
3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the job site.
4. Install pipes to clear all beams and obstructions; do not cut into or reduce the size of load-carrying structural members without the approval of the Architect/Engineer.
5. Back vent all fixtures where required by the Plumbing Code.
6. All risers and off-sets shall be substantially supported.
7. Maximum Hanger Spacing:  

Copper - 1/2 to 1":	6' on run; 2' from offset
Copper - 1 1/4" up:	10' on run; 4' from offset
Steel - All sizes:	10' on run; 6' from offset
Cast Iron - All:	5' on run; and at hubs
Plastic - All:	6' on run; no sags permitted
8. Arrange all piping to maintain required grade and pitch to lines and to prevent vibration. Provide expansion loops and anchors where shown on DRAWINGS.
9. Make all changes in pipe size with reducing fittings.
10. Provide drains at all low points in water piping with 1/2" gate valve with hose nipple, or hose-end boiler drain.
11. No piping shall be installed in such a manner as to permit back siphonage or reverse flow of any liquid in water piping under any conditions.

#### B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside of fittings; use graphite on all cleanout plugs.
2. Pack all joints in cast iron soil and waste pipe and fittings, using oakum and securing with one inch deep lead caulking, fully and properly caulked and smoothly finished, or install "push-on" or "no-hub" joints per manufacturer's requirements.
3. Make all joints in copper pressure pipe with a 95-5 tin-antimony solder applied in strict accordance with the manufacturer's recommendations, except underground water to be silver soldered. Make joints in non-pressure copper tube with 50-50 tin-lead solder.

### 3.3 STERILIZATION OF WATER PIPES

#### A. General

- New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to use. The method to be followed shall be that prescribed by the health authority having jurisdiction, or, in case a method is not prescribed by that authority, the procedure described in either AWWA C601 or AWWA D105 or as described below. This requirement shall apply to "on-site" or "in-plant" fabrication of a system or a modular portion of a system.
1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
  2. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million of chlorine, and the system or part thereof shall be valved off and

- allowed to stand for 24 hours.
3. The system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for three hours.
  4. Following the allowed standing time, the system shall be flushed with clean potable water until chlorine does not remain in the water coming from the system.
  5. The procedure shall be repeated if it is shown by a bacteriological examination made by the authority that contamination is still present in the system.
  6. Provide all labor, equipment, materials, and test kits for chlorine application and tests.
  7. Chlorinate only when the building is unoccupied.
  8. Submit letter to Architect/Engineer certifying that sterilization has been performed and tested according to the above requirements.

### 3.4 CLOSING-IN UNINSPECTED WORK

- A. General
  1. Do not cover up or enclose work until it has been properly and completely inspected and approved.
- B. Noncompliance
  1. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required for test and inspection. After inspection, tests, and approval, make all repairs and replacements with such materials as are necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

### 3.5 TESTING

- A. General
  1. Test all parts of the plumbing installation as specified, as required by applicable codes, and where and as directed by the Architect/Engineer. Make tests before work is covered by earth fill, building construction, or pipe covering. All testing, test gauges and equipment by the Contractor at no additional cost to Owner.
- B. Piping Tests
  1. Sanitary drainage and vent systems: Plug all openings except at the highest point above the roof, and fill the entire system with water to the point of overflow. Water level shall hold constant for two (2) hours. Inspect each joint for visible leaks. All leaks shall be repaired. Doping of pinholes in soil pipe or fittings is not permitted.
  2. Hot and cold water piping shall be subjected to a hydrostatic pressure test of 100 psi for two hours with no pressure loss. Locate and repair leaks and repeat tests until work is tight.

### 3.6 CLEANING

- A. Prior to acceptance of the building, thoroughly clean all exposed portions of the plumbing installation, remove all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item and being careful to avoid all damage to finished surfaces.
- B. Clean all floor drains and traps. Fill all traps. Clean all strainers and faucet aerators.

3.7 EQUIPMENT IDENTIFICATION

- A. Valves shall be provided with brass tags and chains securely attached to the stem or body. They shall be suitably identified by number or name to indicate the service. A framed and glazed directory of these items shall be prepared to show the location and function of each item. The directory shall be mounted in the mechanical room and will be incorporated as part of the Operating and Maintenance Instructions.
- B. All mechanical equipment shall be neatly stenciled in a conspicuous place indicating the service or equipment number.
- C. All pipes shall be identified and provided with flow arrows.

END OF SECTION