SECTION 15180

HYDRONIC PIPING AND SPECIALTIES

# GENERAL

## SUMMARY

### This Section includes piping systems for hot water heating, chilled water, condenser water, condensate drain piping and make‑up water for these systems. Piping materials and equipment specified in this Section include:

#### Pipes, fittings, and specialties;

#### Special duty valves;

#### Hydronic specialties.

## related work specified elsewhere

### The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

#### Section 01300 – Shop Drawings and Submittals

#### Section 15000 – General Piping System and Appurtenances

#### Section 15100 – Valves

#### EVMWD Standard Drawings

## DEFINITIONS

### Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

## SUBMITTALS

### Product Data, including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions for each hydronic specialty and special duty valve specified.

#### Furnish flow and pressure drop curves for diverting fittings and calibrated plug valves, based on manufacturer's testing.

### Welders' certificates certifying that welders meet the quality requirements specified in Quality Assurance below.

### Certification of compliance with ASTM and ANSI manufacturing requirements for pipe, fittings, and specialties.

### Valve schedules showing valve tag data including but not limited to Floor, Unit and Valve Number designations, Product Name, Product Manufacturer and Model number, Design Flow Rate, Operational Pressure Range and Date of Service.

## QUALITY ASSURANCE

### Regulatory Requirements: Comply with the provisions of the following:

#### ASME B 31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

#### Fabricate and stamp air separators and compression tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

#### ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification" for qualifications for welding processes and operators.

#### Latest Edition of the California Building Code.

## SEQUENCING AND SCHEDULING

### Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 3.

### Coordinate the installation of pipe sleeves for foundation wall penetrations.

# PRODUCTS

## MANUFACTURERS

### Manufacturer: Subject to compliance with requirements, provide hydronic piping system products from one of the following:

#### Calibrated Balancing Valves:

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

##### Griswold

##### Flow Design-AutoFlow

#### Pump Multipurpose Valves:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

#### Safety Relief Valves:

##### Amtrol, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Spirax Sarco.

##### Watts Regulator Co.

#### Pressure Reducing Valves:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

#### Air Vents:

##### Armstrong Machine Works.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Hoffman Specialty ITT; Fluid Handling Div.

##### Spirax Sarco.

#### Tangential Air Separators:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

#### Compression Tanks:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

#### Bladder/Diaphragm‑Type Air Elimination Tanks:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT

##### Taco, Inc.

#### Pump Suction Diffusers:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

##### Victaulic Company of America

#### Diverting Fittings:

##### Amtrol, Inc.

##### Armstrong Pumps, Inc.

##### Bell & Gossett ITT; Fluid Handling Div.

##### Taco, Inc.

#### Automatic Flow Limiting Balancing Devices:

##### Bell & Gossett ITT; Fluid Handling Div.

##### Flow Design- AutoFlow

##### Griswold

##### Kates

## PIPE AND TUBING MATERIALS

### **Hard Drawn Temper Copper Tubing:** ASTM B 88, Type L, for make-up water piping.

### **Hard Drawn Temper Copper Tubing:** ASTM B 306, Type DWV, for above grade condensate drain piping.

### **Hard Drawn Temper Copper Tubing:** ASTM B 88, Type K & L, for heating hot water, chiller water and condenser water piping.

### **Steel Pipe:** 2½” and larger; ASTM A 53, Grade B, Schedule 40, seamless or ERW, black steel pipe, bevel ends for welding, for heating hot water, chiller water and condenser water. 2”, ASTM A 53, Grade B, Schedule 40, seamless or ERW, black steel pipe, threaded and coupled furnished with coupling, for heating hot water, chiller water and condenser water. 1½” and smaller, ASTM A 53, Grade B, schedule 40 seamless black steel pipe, threaded and coupled furnished with coupling, for heating hot water, chiller water and condenser water.

## FITTINGS

### **Cast Iron Threaded Fittings:** ANSI B16.4, Class 125 and 250 as applicable, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

### **Malleable‑Iron Threaded Fittings:** ANSI B16.3, Class 150 and 250 as applicable, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

### **Malleable-Iron Unions:** ASME B16.39, Classes 150, 250 and 300 as applicable, hexagonal stock, with ball‑and‑socket joints, metal‑to‑metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.

### **Steel Fittings:** ASTM A 234, wall thickness to match adjoining pipe for welded joints.

### **Wrought‑Copper Fittings:** ANSI B16.22, streamlined pattern.

### **Wrought-Copper Unions:** ASME B16.22

### **Cast‑Iron Threaded Flanges:** ANSI B16.1, Class 125; raised ground face, bolt holes spot faced.

### **Cast Bronze Flanges:** ANSI B16.24, Class 150; raised ground face, bolt holes spot faced.

### **Steel Flanges and Flanged Fittings:** ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:

#### Weld-Neck or Slip-on, Raised Face standard, Flat Face where necessary to match valves or equipment.

#### Slip-on not permitted at valves or equipment.

### **Gasket Material:** thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.

### **Dielectric Unions:** Threaded or soldered end connections for the pipe materials in which installed; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

## JOINING MATERIALS

### **Solder Filler Metals:** Equal to Taramet “Sterling” solder, conforming to ASTM B32, Alloy Grade TC, 95% tin, 4.85% copper, 0.15% selenium.

### **Solder Flux:** Equal to Taramet “Sterling” lead free water soluble flux, conforming to ASTM B 813

### **Brazing Filler Metals:** Silphos brazing rods (5% silver content) conforming to AWS A5.8, Classification B Ag 1 (Silver).

#### WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.

### **Welding Materials:** Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

### **Gasket Material:** thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.

## GENERAL DUTY VALVES

### General duty valves (i.e., check, ball, and butterfly valves) are specified in Section 15100 – Valves, General.

## SPECIAL DUTY VALVES

### **Calibrated Balancing Valves:** 125 psig water working pressure, 250 deg F maximum operating temperature, bronze body, calibrated ball valve. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening. Valves 2 inch and smaller shall have threaded connections and 2‑1/2 inch valves shall have flanged connections.

### **Pump Multipurpose Valves:** 175 psig working pressure, 300 deg F maximum operating temperature, cast‑iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non‑slam check valve with spring‑loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff. Pump discharge valve shall be selected with pressure drop of no less than 3 feet of head and no more than five feet head at specified flow unless otherwise scheduled or detailed.

### **Pressure Reducing Valves:** diaphragm operated, cast‑iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut‑down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory‑set at operating pressure and have the capability for field adjustment.

### **Safety Relief Valves:** 125 psig working pressure and 250 deg F maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast‑iron, with all wetted internal working parts made of brass and rubber. Select valve to suit actual system pressure and Btu capacity.

### **Combined Pressure/Temperature Relief Valves:** diaphragm operated, cast‑iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut‑down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory‑set at operating pressure and have the capability for field adjustment. Safety relief valve designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast‑iron, with all wetted internal working parts made of brass and rubber; 125 psig working pressure and 250 deg F maximum operating temperature. Select valve to suit actual system pressure and Btu capacity. Provide with fast fill feature for filling hydronic system.

### Automatic Flow Control Valves:

#### Design:

##### The GPM for the automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5% of the specified GPM over at least 95% of the control range. The flow control cartridge regulator shall be constructed by the product manufacturer and shall not be field constructed.

##### For 1/2”-2”, the flow cartridge regulator shall be removable from the body housing without the use of special tools to provide access for regulator change-out, inspection and cleaning without breaking the main piping.

##### **Pump head requirement:** The permanent pressure loss added to the pump head shall not exceed 5 PSI. Flow Ranges 0-11 GPM Starting Pressure shall nominally be 2 PSI or Less, 11-50 GPM Starting Pressure shall be nominally 3 PSI or less and Flows 50 GPM or greater shall start at 5 PSI or less. Flow Regulator Control range shall nominally be to differential pressure of 60 PSI. Provide 90 PSI range where required.

##### Each valve shall have shall have two P/T ports.

##### All automatic flow control devices shall be supplied by a single source and certified flow tests, witnessed by a professional engineer, shall be available.

##### Cartridge regulators rated for higher differential pressure service (2-60 PSI or greater) shall utilize a reinforced rolling seal separating the static cartridge section from the dynamic cartridge section. The cartridge pressure regulator shall provide differential pressure control for flow limit control.

##### Cartridge regulator flow control areas shall be simple orifices. Orifices shall be removable.

##### Cartridge regulator valve housing shall incorporate integral ball shutoff valve leaving the valve housing and union nut tail piece entry to valve body incorporating tail pieces in sweat, male and female NPT threads.

#### Construction:

##### Cartridge regulator valve housing shall be de-zincification resistant brass body incorporating integral ball shutoff valve leaving the valve housing rated at 400 PSI at 250˚F service, Teflon seats, EPDM O-ring seals of pressure control areas and leakage paths, and union nut tail piece entry to valve body incorporating tail pieces in sweat, male and female NPT threads and EPDM O-ring seals.

##### Machined cartridges may be dezincification resistant brass or stainless steel.

##### Drawn cartridges shall be stainless steel.

##### Spring compensation of the internal flow cartridge body shall not use fixed shims. A crimped sheet metal design is not acceptable.

##### Differential pressure control cartridges shall utilize EPDM rolling seal connecting static and moving cylinders of cartridge regulator.

##### Flow Control Cartridge Regulator shall maintain fixed differential pressure across flow control orifice.

##### The internal flow cartridge shall be permanently marked with the flow code and spring range when multiple spring ranges are applied to the cartridge design.

##### For 1/2” through 2” pipe sizes: An assembly shall consist of a dezincification brass Y-type body, integral brass body ball valve and ‘O’ ring type union.

##### For 2 1/2” and larger flanged connections: Ductile-iron body suitable for mounting wafer style between standard 150# or 300# flanges. The long flange bolts and nuts shall be provided with each control valve.

##### All valves shall be factory leak tested at 100 psi air under water.

#### Minimum Ratings:

##### 1/2” through 2” pipe size: 400 PSIG at 250°F

##### 2 ½” through 14” pipe size: 600 PSIG at 250°F

##### 16” through 30” pipe size: 250 PSIG at 250°F

#### Install automatic flow control valves on the return side of equipment/coils. Provide handle and port extensions of sufficient length to clear insulation thickness on cold-water applications. Hot water applications do not require the valve to be insulated.

#### Install, on the supply side of equipment/coil, an integrated ball isolation valve and Y-strainer with union (20 mesh) with brass drain valve with integral 3/4” hose-end connection with cap, and one pressure/temperature reading port. Basket type strainers are not acceptable. Valve body shall incorporate plugged tappings for additional P/T ports.

#### All valves shall be factory tagged with the Floor, Unit, Coil (or Valve) number designated by the designer. Valve tag data shall include but not be limited to Product Name, Product Manufacturer and Model number, Design Flow Rate, Operational Pressure Range and Date of Service. Valve tags shall be flexible plastic weatherproof tag tie wrapped to valve handle hole or valve body. Valve tags shall be laser printed. Valve tagging data shall be supplied to commissioning or testing and balancing agency in electronic database format capable of being imported to commonly supplied database and spreadsheets found on personal computers for use in verification forms.

#### Valves and associated specialties required for coil/equipment installation shall be supplied to the field boxed in groups associated and sorted by floors and units. Valve tag data shall be affixed to box package exterior. Coil Valve components shall have specialty packaging combining required installation components and installation sheets in one package. The valve package shall be labeled with the data shown on the valve tag. Valve packages shall be wrapped, or separated from other boxed packages in floor groups by paper, cardboard or foam in place material. No expanded packaging pellets shall be used.

## HYDRONIC SPECIALTIES

### **Manual Air Vent:** bronze body and nonferrous internal parts; 150 psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; and having 1/8 inch discharge connection and 1/2 inch inlet connection.

### **Compression Tanks:** size and number as indicated; construct of welded carbon steel for 125 psig working pressure, 375 deg F maximum operating temperature. Provide taps in bottom of tank for tank fitting; taps in end of tank for gage glass. Tank with taps constructed shall be tested and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 1. Furnish with the following fittings and accessories:

#### **Air Control Tank Fitting:** cast‑iron body, copper‑plated tube, brass vent tube plug, and stainless steel ball check (100 gallon unit only); sized for compression tank diameter. Design tank fittings for 125 psig working pressure and 250 deg F maximum operating temperature.

#### **Tank Drain Fitting:** brass body, nonferrous internal parts; 125 psig working pressure and 240 deg F maximum operating temperature. Fitting shall be designed to admit air to the compression tank and drain water, plus close off the system.

### **Bladder/Diaphragm-Type Air Elimination Tanks:** Size and number as indicated; shell constructed of steel per ASME Section VIII, Division 1; bladder/diaphragm constructed of heavy duty Butyl, bladder type to be removable for inspection and replacement; working pressure of 125 psig; and designed for a maximum operating temperature of 240° F.

### **Tangential Air Separator:** Welded black steel; ASME constructed and labeled for minimum 125 psig water working pressure and 375° F operating temperature; perforated stainless steel air collector tube designed to direct released air into compression tank; tangential inlet and outlet connections; screwed connections up to and including 2" NPS; flanged connections for 1‑1/2" NPS and above; threaded blowdown connection; sized as indicated for full system flow capacity.

### **Pump Suction Diffusers:** cast‑iron body, with threaded connections for 2 inch and smaller, flanged connections for 2‑1/2 inch and larger; 175 psig working pressure, 300 deg F maximum operating temperature; and complete with the following features:

#### Inlet vanes with length 2‑1/2 times pump suction diameter or greater.

#### Cylinder strainer with 3/16 inch diameter openings with total free area equal to or greater than 5 times cross‑sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head.

#### Disposable fine mesh strainer to fit over cylinder strainer.

#### Permanent magnet, located in flow stream, removable for cleaning.

#### Adjustable foot support, designed to carry weight of suction piping.

#### Blowdown tapping in bottom; gage tapping in side.

### **Diverting Fittings:** cast iron body with threaded ends, or wrought copper with solder ends; 125 psig working pressure, 250 deg F maximum operating temperature. Indicate flow direction on fitting.

# EXECUTION

## PIPE APPLICATIONS

### Install Type L, hard drawn copper tubing with wrought copper fittings and solder joints for 1½” and smaller, above ground, within building.

### Install Type DWV, hard drawn copper tubing with wrought copper fittings and solder joints for condensate drain lines, above ground, within building.

### Install Type L, drawn copper tubing with wrought copper fittings and Silphos joints for 2” and larger, above ground, within building.

### Install Type K, hard drawn copper tubing with wrought copper fittings and Silphos joints for 2” and larger, below ground.

### Install steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2½”and larger.

## PIPING INSTALLATIONS

### **Locations and Arrangements:** Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

### Use fittings for all changes in direction and all branch connections.

### Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

### Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

### Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

### Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

### Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap.

### Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals.

### Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity.

### Install piping at a uniform grade of 1 inch in 40 feet upward in the direction of flow.

### Make reductions in pipe sizes using eccentric reducer fitting installed with the level side up.

### Install branch connections to mains using Tee fittings in main with take‑off out the bottom of the main, except for up‑feed risers, which shall have take‑off out the top of the main line.

### Install unions in pipes 2 inch and smaller, adjacent to each valve, at final connections to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

### Install dielectric unions to join dissimilar metals.

### Install flanges on valves, apparatus, and equipment having 2‑1/2 inch and larger connections.

### Install flexible connectors at inlet and discharge connections to pumps (except inline pumps) and other vibration producing equipment.

### Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, inline pump, and elsewhere as indicated. Install nipple and ball valve in blow down connection of strainers 2 inch and larger.

### Anchor piping to ensure proper direction of expansion and contraction. Expansion loops and joints are indicated on the Drawings.

### All metallic piping in mechanical rooms that is not insulated shall be painted with two coats of rust preventive paint in accordance with Division 9 of these specifications. Color shall be in accordance with ANSI A13.

### All uninsulated piping below grade shall be protected in accordance with the manufacturer’s written recommendations and installation instructions for the intended application with Tapecoat H50 Gray, Tapecoat 20 and Tapecoat TC Sl/75 for joints or a prior approved equivalent means of corrosion protection.

## HANGERS AND SUPPORTS

### General: Hanger, supports, and anchors devices are specified in Section 15060-B.

## PIPE JOINT CONSTRUCTION

### **Soldered Joints:** Copper tube sizes 1 ½” and smaller.

### **Brazed Joints:** Copper tube sizes 2” and larger. Comply with the procedures contained in the AWS "Brazing Manual."

#### CAUTION: Remove stems, seats, and packing of valves and accessible internal parts at piping specialties before brazing.

#### Fill the pipe and fittings during brazing, with an inert gas (ie., nitrogen or carbon dioxide) to prevent formation of scale.

#### Heat joints using oxy‑acetylene torch. Heat to proper and uniform temperature.

### **Threaded Joints:** Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe fittings and valves as follows:

#### Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

#### Align threads at point of assembly.

#### Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

#### Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

##### **Damaged Threads:** Do not use pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

### **Welded Joints:** Comply with the requirement in ASME Code B31.9‑"Building Services Piping."

### **Flanged Joints:** Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

## VALVE APPLICATIONS

### **General Duty Valve Applications:** The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:

#### **Shut‑off duty:** use ball and butterfly valves.

#### **Throttling duty:** use globe, ball, and butterfly valves.

#### Install shut‑off duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.

#### Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, elsewhere as indicated.

### Install calibrated balancing and or automatic flow limiting devices valves on the outlet of each heating or cooling element, elsewhere as required to facilitate system balancing and as scheduled or detailed on the drawings.

### Install drain valves at low points in mains, risers, branch lines, coils, and elsewhere as required for system drainage.

### Install checks valves on each pump discharge, if pump is not provided with a multipurpose valve and elsewhere as required and or indicated to control flow direction.

### Install pump multipurpose valves with stem in upward position; allow clearance above stem for check mechanism removal.

### Install safety relief valves on hot water generators, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation requirements.

### Install pressure reducing valves on hot water generators, and elsewhere as required to regulate system pressure.

### Do not insulate over valve adjustment handles. Taper insulation to allow full access and movement of handle.

### Do not insulate over pressure ports on balancing valves. Provide nippled extensions with the manufacturer’s gage tapping relocated at the end of the nippled extension or factory port extensions.

## HYDRONIC SPECIALTIES INSTALLATION

### Install manual air vents at high points in the system, at heat transfer coils, and elsewhere as required for system air venting.

### Install combination air separator/strainer in pump suction lines. Run piping to compression tank with 1/4 inch per foot (2 percent) upward slope towards tank. Install blowdown piping with gate valve; extend to nearest drain.

### Install pump suction diffusers on pump suction inlet, adjust foot support to carry weight of suction piping. Install nipple and ball valve in blowdown connection.

### Install pump discharge valves in horizontal or vertical position with stem in upward position. Allow clearance above stem for check mechanism removal.

### Install shot‑type chemical feeders in each hydronic system where indicated; in upright position with top of funnel not more than 48 inches above floor. Install feeder in bypass line, off main using globe valves on each side of feeder and in the main between bypass connections. Pipe drain, with ball valve, to nearest equipment drain.

### Install compression tanks above air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

#### Support tank as detailed on the Drawings. In the absence of details provide support from the floor or structure above sufficient for the weight of the tank, piping connections, and fittings, plus weight of water assuming a full tank of water. Do not overload building components and structural members.

### Install bladder type expansion tanks as recommended by the tank manufacturer.

#### Provide support from the structure above sufficient for the weight of the tank piping connections, and fittings, plus weight of water assuming a full tank of water. Do not overload building components and structural members.

#### Charge IAW manufacturers IOM instructions.

## FIELD QUALITY CONTROL – HYDRONIC SYSTEMS

### Preparation for testing: Prepare hydronic piping in accordance with ASME B 31.9 and as follows:

#### Leave joints including welds un-insulated and exposed for examination during the test.

#### Insure that flow limiting valve flow control cartridges are uninstalled.

#### Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.

#### Flush system with clean water. Clean strainers. Prepare one gallon sample of flushed cleaning water to show clarity prior to final fill.

#### Where automatic flow limiting valves are installed, install associated cartridge and flow control orifice.

#### Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

#### Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of over-pressure during the test.

### Testing: Test hydronic piping as follows:

#### Refer to Section 15015-B.

### Post Testing: Upon completion of system testing complete system insulation.

END OF SECTION