SECTION 15180
HVAC PIPING

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary Conditions, and Division 1 General Requirements, apply to work specified in this Section.

B. Requirements of Section 15050, "Basic Mechanical Materials and Methods" apply to work specified in this Section.

1.02 SUMMARY

A. This Section includes piping systems for hot water heating, energy recovery, low pressure steam and low pressure condensate return piping. Piping materials and equipment specified in this Section include:
   1. Pipes, fittings, and specialties.
   2. Special duty valves.
   3. Hydronic specialties.

B. Related Work Specified in Other Sections:
   1. Materials and methods for sealing pipe penetrations through basement walls, and fire barriers: Section 07840, "Fire stop Systems".
   2. Labeling and identification of hydronic piping system: Section 15075, "Mechanical Identification"
   3. Gate, globe, ball, butterfly, and check valves: Section 15110 "Valves"
   4. Pipe Supports: Section 15060, "Hangers and Supports"
   6. Flexible pipe connections: Section 15070, "Vibration Control and Seismic Restraints".
   7. Pipe insulation: Section 15080, "Mechanical Insulation"
   8. Temperature control valves and sensors: Section 15910, "Control Systems"
   9. Procedures for hydronic systems adjusting and balancing: Section 15950, "Testing, Adjusting and Balancing"

1.03 DEFINITIONS

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

B. Low Pressure Steam Systems operate at 15 psig (100 kPa above atmospheric) and under.

1.04 SYSTEM DESCRIPTION

A. Hydronic piping systems specified in this Section include the hot water, and energy recovery water piping systems.

B. Steam heating systems specified in this Section include the low pressure steam and low pressure condensate return piping systems. This system is classified by ASHRAE as a Low-pressure steam, gravity condensate return system.

1.05 SUBMITTALS

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

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

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Refer to Section 01410 for applicable codes. In addition, comply with the provisions of the following:

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

2. ASME “Boiler and Pressure Vessel Code”, Section IX, “Welding and Brazing Qualification” for qualifications for welding processes and operators.

3. City of Portland, ME Code of Ordinances.

B. Comply with USM IDAT requirements.

1.07 SEQUENCING AND SCHEDULING

A. Work closely with the temperature control contractor to coordinate installation of temperature control devices.

B. Cooperate and work closely with the Testing, Adjusting and Balancing contractor to coordinate the start-up and correct operation of the installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Subject to compliance with requirements, provide products from one of the following:

A. Flow-Balancing Valves:
1. “Circuit Setter”, Bell & Gossett, Inc.
2. “Circuit Setter”, Taco, Inc.

B. Air Vents (manual and automatic):
1. Armstrong Machine Works.
2. Bell & Gossett ITT; Fluid Handling Div.

3. Hoffman Specialty ITT; Fluid Handling Div.
4. Spirax Sarco.

C. Y-Pattern Strainers:
1. Armstrong Machine Works.
2. Hoffman Specialty ITT; Fluid Handling Div.
3. Metraflex Co.
4. Spirax Sarco.
5. Watts Regulator Co.

2.02 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3 Article "Pipe Applications" for identification of where the below materials are used.

B. Drawn Temper Copper Tubing: ASTM B 88, Type L.

C. Steel Pipe: ASTM A 53, Type E (electric-resistance welded), Grade B, Schedule 40, plain ends.

D. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, Schedule 40, carbon steel.

2.03 FITTINGS

A. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

C. Wrought-Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

D. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.

E. Cast-Iron Threaded Flanges: ASME B16.1, Class 125; raised ground face, bolt holes spot faced.

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

G. Wrought-Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:
1. Material Group: 1.1.
2. End Connections: Butt Welding.
3. Facings: Raised face.

H. Wrought-Copper Unions: ASME B 16.2

I. Malleable-Iron Unions: ANSI B16.39, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.

2.04 GENERAL DUTY VALVES

A. General duty valves (i.e. gate globe ball check and butterfly valves) are specified in Division Section 15110, “Valves”.

2.05 HYDRONIC SPECIALTIES

A. 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.

B. Automatic Air Vent: designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240 deg F operating temperature; and having 1/4 inch discharge connection and 1/2 inch inlet connection.

C. Flow Balancing Valve: Flow-balancing systems include calibrated flow element, separate meter, hoses or tubing, valves, fittings, and conversion chart that is compatible with flow element, meter and system fluid.
   1. Flow range of flow-measuring element and meter covers operating range of equipment or system where used.
   2. Portable Meters: Differential-pressure gage and two twelve foot hoses in carrying case with handle.
      a. Scale: In inches of water unless otherwise indicated.
      b. Accuracy: Plus or minus two percent between 20 to 80 percent of range.
   3. Include complete operating instructions with each meter.

D. Y-Pattern Strainers: 125 psig working pressure cast-iron body (ASTM A 126, Class B), flanged ends for 2-1/2 inch and larger, threaded connections for 2 inch and smaller, bolted cover, perforated Type 304 stainless steel basket, and bottom drain connection.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine rough-in for piping systems to verify actual locations of piping connections prior to installation.

B. Install HVAC equipment level and plumb, according to manufacturer's written instructions, rough-in drawings, the original design, and referenced standards.

3.02 PIPE APPLICATIONS

A. Hot Water and Energy Recovery Water 2" and Smaller: Type L, drawn copper tubing with wrought copper fittings and soldered or threaded joints.

B. Hot Water and Energy Recovery Water 2-1/2" and Larger: Steel pipe with welded and flanged joints and fittings.

C. Steam Piping, 2-Inch NPS and Smaller: Schedule 40 steel pipe with threaded joints and Class 125 cast-iron fittings.

D. Steam Piping, 2-1/2- to 12-Inch NPS: Schedule 40 steel pipe with welded joints, Schedule 40 wrought-steel welding fittings, and Class 150 wrought-steel flanges.

E. Condensate Piping, 2-Inch NPS and Smaller: Schedule 80 steel pipe with threaded joints and Class 125 malleable-iron fittings.

F. Condensate Piping, 2-1/2- to 12-Inch NPS (DN65 to DN300): Schedule 80 steel pipe with welded joints, Schedule 40 wrought-steel welding fittings, and Class 150 wrought-steel flanges.

G. Install steel pipe with threaded joints and Class 125 cast-iron fittings for 2 inch and smaller, and with welded joints, wrought-steel welding fittings, and Class 150 wrought-steel flanges, for 2-1/2 inch and larger. Steam supply pipe shall be schedule 40. Condensate return pipe shall be schedule 80.

3.03 PIPING INSTALLATIONS

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

B. Install piping in accordance with Section 15050, “Basic Mechanical Materials and Methods”.

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

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

E. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

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

G. 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.

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

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

J. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Fire stopping is specified in Section 07840.

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

L. Install steam supply piping at a uniform grade of 1/4 inch in ten feet downward in the direction of flow

M. Install condensate return piping at a uniform grade of 1/2 inch in ten feet downward in the direction of flow.

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

O. Install branch connections to hydronic 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.

P. Install branch connections to steam mains with take-offs from the top of the main. Use of 90 degree “tee” fittings is permissible, where use of 45 degree fittings is not practical. Where the length of a branch takeoff is less than 10 feet, pitch branch line down toward mains, 1/2 inch per 10 feet.

Q. Make reductions in steam pipe sizes using eccentric reducer fitting installed with the level side down.

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

S. Install flanges on valves, apparatus, and equipment having 2-1/2" and larger connections.

T. 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.

U. Anchor piping to ensure proper direction of expansion and contraction. Expansion loops and joints are indicated on the Drawings and specified in Division-15.

V. Install drip legs at low points and natural drainage points in the steam system, such as at the ends of mains, bottoms of risers, and ahead of pressure regulators, control valves, isolation valves, pipe bends, and expansion joints.

1. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 200 feet where pipe is pitched down in the direction of the steam flow and a maximum of 150 feet where the pipe is pitched up so that condensate flow is opposite of steam flow.

2. Size drip legs at vertical risers full size and extend beyond the rise. Size drip legs at other locations same diameter as the main. Provide an 18 inch drip leg for steam mains smaller than 6 inches. In steam mains 6 inches and larger, provide drip legs sized 2 pipe sizes smaller than the main, but not less than 4 inches.

3. Drip legs, dirt pockets, and strainer blow-downs shall be equipped with gate valves to allow removal of dirt and scale.

4. Install steam traps close to drip legs.

3.04 VALVE APPLICATIONS

A. Install calibrated plug valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.

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

C. Install flow balancing valves on the outlet of each heating element and elsewhere as required to facilitate system balancing. Include test ports on all balancing valves to facilitate balancing instrument measurements.

3.05 HYDRONIC SPECIALTIES INSTALLATION

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

B. Install automatic air vents at high points in the system, heat transfer coils, and elsewhere as required for system air venting, within the mechanical room(s). Refer to details for locations requiring automatic air vents.

3.06 EQUIPMENT CONNECTIONS

A. The Drawings indicate the general arrangement of piping, fittings and specialties.

B. Make indicated connections while arranging piping to allow effective servicing and maintenance.

3.07 FIELD QUALITY CONTROL

A. Prepare hydronic piping in accordance with ASME B 31.9 and as follows:

1. Leave joints including welds uninsulated and exposed for examination during the test.

2. 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.

3. Chemically clean and flush system with clean water. Clean strainers.

4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate 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.

5. Install relief valve set at a pressure no more than 1.33 times the test pressure, to protect against damage by expansion of liquid or other source of overpressure during test.

B. Prepare steam and condensate piping in accordance with ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during the test.

2. 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.

3. Flush system with clean water. Clean strainers.

4. 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 test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

5. 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 overpressure during the test.

C. Test hydronic piping as follows:

1. Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for workers and compatible with the piping system components.

2. Use vents installed at high points in the system to release trapped air while filling the system. Use drains installed at low points for complete removal of liquid.

3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low pressure filling lines are disconnected.

4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9, Code For Pressure Piping, Building Services Piping.

5. After the hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

D. Test steam and condensate piping as follows:

1. Use ambient temperature water as the testing medium, except where there is risk of damage due to freezing. Another liquid may be used if it is safe for workers and compatible with piping system components.

2. Use traps installed at high points in the system to release trapped air while filling system. Use drip legs installed at low points for complete removal of liquid.

3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low pressure filling lines are disconnected.

4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Check to verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9.

5. After the hydrostatic test pressure has been applied for at least 10 minutes, examine the system for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

E. Prepare and submit written report of testing compliant with USM IDAT requirements

3.08 ADJUSTING AND CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris; repair damaged finishes, including chips, scratches, and abrasions.

B. Ensure that new system is filled and vented prior to cleaning. Use water meter to record capacity in new system.

C. Prior to connecting new system to existing system add cleaning chemicals compatible with existing system treatment and recommended by existing system water treatment provider. Apply heat while circulating, slowly raising system to design temperature; maintain for a minimum of 12 hours. Remove heat and allow to cool; drain and refill with clean water. Circulate for 6 hours at design temperature, then drain. Refill with clean water and repeat until system cleaner is removed.

D. Clean and flush new hydronic piping systems. After cleaning and flushing new hydronic piping system connect to existing system. Remove, clean, and replace existing hot water system strainer screens.

E. Obliterate existing balance marks and remark calibrated name plates of pump discharge valves after hydronic system balancing that comprehend the new system has been completed, to permanently indicate final balanced position.

3.09 START UP

A. Check expansion tanks to determine that they are appropriately pressurized and that the system is completely full of water.

B. Before operating the system perform these steps:
   1. Open valves to full open position.
   2. Remove and clean strainers.
   3. Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).

C. Review data in Operating and Maintenance Manuals. Refer to Division 1 Section01770 "Closeout Procedure and Submittals."

D. Schedule training with Owner through the architect, with at least 7 days advance notice.

E. Comply with USM IDAT requirements.

   a. Provide flow curves for all flow elements for the O & M documentation.

   b. Provide information for all equipment provided. In other words, if a unit heater, fire damper, etc. is provided and no O & M material is available from the manufacturer, at a minimum, include the installation instructions and model/capacity data. Provide O & M for all scheduled material.

SECTION CONTINUES WITH FOLLOWING TABLES

SERVICE: HEATING HOT WATER SUPPLY AND RETURN
ENERGY RECOVERY SUPPLY AND RETURN

Limitation: 0 - 125 psig; 200 Deg. F.

ITEM	2" AND SMALLER	2-1/2" AND LARGER
Pipe	Copper tube Type L, hard drawn temper ASTM B88	Sch. 40 black, ASTM A120 or ASTM A53, Grade "B", beveled ends
Fittings	Wrought copper solder joint fittings; ANSI B16.22 (Note 1)	Std. Wt. black steel butt welding; ASTM A234 Grade "WPB", ANSI B16.9
Joints		150lb. flat-faced or RF* weld neck or slip-on flanges; ASTM A181 Grade "1", ANSI B16.5 (Note 2)
Gate Valves	150lb. WSP, screwed pattern, brass or bronze body, rising stem; ASTM Crane No. 431, Walworth No. 56, or Stockham No. B122	125lb. WSP, flat-faced flanged iron body, brass or bronze trimmed, O.S.& Y.; ANSI B16.1 flanges; Crane No. 465-1/2, Walworth No. 726F, Jenkins No. 651A or Stockham No. G623
Butterfly valves		200 psi; cast-iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O-ring stem seals. Crane No. 24NBRB or equal by Centerline Demco or Keystone. Lock lever operator thru 6"; Gear operator for 8" and larger.
Globe valves	Class 125; body and union bonnet of ASTM B 62 cast bronze; with threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron hand wheel; Crane No. 1, Walworth No. 58 or Stockham No. B16	Class 125 iron body and bolted bonnet conforming to ASTM A 126, Class B; with outside screw and yoke, bronze mounted, flanged ends, and "Teflon" impregnated packing, and two-piece backing gland assembly. Crane No. 351, Walworth No. 906F or Stockham No. G512

ITEM	2" AND SMALLER	2-1/2" AND LARGER
Ball valves	400lb. WOG brass or bronze top entry type body, brass chrome finish ball and blow-out proof stem, TFE seats and seals; Crane No. 2190H or equal by Milwaukee or Stockham	
Check valves	Class 125, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Crane No. 36, Walworth No. 420, Jenkins No. 762A or Stockham No. B345	Class 125 cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, and bronze disc or cast-iron disc with bronze disc ring; and flanged ends. Crane No. 373 or Stockham No. G931
Bolting		Square head machine bolts with heavy hex nuts, ASTM A307 Grade "B"
Gaskets		Full -faced compressed sheet packing, 1/16" thick,
Thread compound	Teflon paste or Teflon tape	150lb. RF flexitallic CGP, 340SS & FF of similar quality

Note 1: Provide dielectric fittings as specified for all cases where copper pipe connections are made to piping or to an item of equipment of a dissimilar metal.

Note 2: Use flat faced flanges where piping connects to FF equipment or CI flanges.

SERVICE: LOW – MEDIUM PRESSURE STEAM

Limitation: Above ground (and in pipe trenches): 125 psig; 200 Deg. F.

Item	2" and Smaller	2-1/2" and larger
Pipe	Schedule 40 black steel, ASTM A53, ERW or seamless, Grade B	Schedule 40 black steel, ASTM A53, ERW or seamless, grade B, beveled ends; standard weight for 12" and above.
Fittings	Cast iron, 125 lb. ASTM A126 or malleable iron, 150 LB. ASTM A197	Std. Wt. black steel butt welded; ASTM A234
Joints	Screwed unions, 250 lb. ASTM197	Welded; flanged 150lb. flat-faced or raised face weld neck or slip-on flanges; A ASTM A181; 150#, forged steel at valves and equipment
Ball valves	MSS SP-110, 150 SWP, 600 psi non-shock CWP, WOG, two piece, cast bronze bodies, full port, stainless steel ball and blow-out proof stem, threaded ends; Crane No. 2180, Milwaukee No. BA-200, Powell No. 4210B or Stockham No. S-206-T	
Gate Valves	MSS SP 80, Class 125, 125 psi SWP, 200 psi non-shock CWP, ASTM B-62 cast bronze body, union bonnet and solid wedge, threaded ends Crane No. 431, Jenkins No. 49, Walworth No. 56, Powell No. 514SW or Stockham No. B122	MSS SP-70, Class 125, 100 psi SWP, 150 psi non-shock CWP, iron body, bronze mounted OS & Y, ASTM A-126 cast iron body and bolted bonnet, flanged ends. Crane No. 465-1/2, Powell No. 1793 or Stockham No. G-623, NIBCO F-617-0, Milwaukee F2885A
Globe valves	MSS SP80, class 125, 125 psi SWP, 200 psi CWP, ASTM B-62 cast bronze body and bonnet, threaded ends Crane No. 1, Powell No. 650 or Stockham No. B16, NIBCO T-211-B, Milwaukee 502	MSS SP-85, Class 125, 125 psi SWP, 200 psi non-shock CWP, iron body, bronze mounted OS & Y, ASTM A-126 Class B cast iron body and bolted bonnet, flanged ends. Crane No. 351, Jenkins No. 613, Powell No. 241 or Stockham No. G-512, NIBCO F-718-B, Milwaukee F2981A

Service: Low – Medium Pressure Steam (continued)

Check Valves	MSS SP-80, class 125, 125 psi SWP, 200 psi non-shock CWP, ASTM B-62 cast-bronze composition body and cap, t-pattern swing type, screwed ends. Crane No. 36, Walworth No. 420. Jenkins No. 762-A, Powell No. 560Y or Stockham No. B-345	MSS SP-71, Class 125, 125 psi SWP, 200 psi non-shock CWP, iron body, bronze mounted OS & Y, ASTM A-126 Class B cast iron body and bolted bonnet, swing type disk, flanged ends. Crane No. 373, Walworth No. 928-F, Jenkins No. 624, Powell No. 559 or Stockham No. G-931
Bolting		Square head machine bolts with heavy hex nuts: ASTM A307 Grade B
Gaskets		Full faces compressed sheet packing
Thread compound	Teflon paste or Teflon tape	150lb. RF flexitallic CGP, 340SS & FF of similar quality

Note A: Use flat faced flanges where piping connects to FF equipment or CI flanges.
Note B: Provide similar butterfly valves with gear operators for valve sizes 8” and over

SERVICE: STEAM CONDENSATE, GRAVITY OR PUMPED

Limitation: 125 psig; 200 Deg. F.

Item	2" and Smaller	2-1/2" and larger
Pipe	Black steel, schedule 80, ASTM 120, ERW, Grade B or A106 seamless	Black steel, Schedule 80, ASTM 53 or 120, seamless Grade B
Fittings	Cast iron, 125 lb. ASTM A126 or malleable iron 150 lb. ASTM 197	Standard weight, butt welded, black steel, ASTM A234
Joints	300 lb. Black malleable iron unions, brass to iron seats; ASTM197	150 lb. Flat faced or raised face weld neck or slip-on flanges; ASTM A181 grade 1, ANSI B16.5
Ball valves	150lb. WOG, 600psi CWP. ASTM B-61 or 62, bronze top entry type body, stainless steel ball and stem, EPT seats and seals; Crane No. 2180, Milwaukee No. BA-200, Powell No. 4210B or Stockham No. S-206-T	
Gate Valves	150lb. WSP, screwed pattern, brass or bronze body, rising stem; Crane No. 431, Jenkins No. 49, Walworth No. 56, Powell No. 514SW or Stockham No. B122	125lb. WSP, flat face flanged iron body, brass or bronze trimmed, O.S.& Y.; ANSI B16.1 flanges; Crane No. 465-1/2, Walworth No. 726-F, Jenkins No. 651-A, Powell No. 1793 or Stockham No. G-623
Butterfly Valves		200lb. differential iron body lugged, renewable EPT seat, Crane No. 44-FXB-TL, Centerline Series LT, Demco No. NE-175-5215311 or Stockham No. LG712-SS2-B B
Globe valves	125lb. WSP, screwed pattern, brass or bronze body, brass or bronze disk; Crane No. 1, Walworth No. 58, Powell No. 650 or Stockham No. B16	125lb. WSP, flat face, flanged CS body, bronze trimmed, O.S.& Y.; ANSI B16.1 flanges; Crane No. 351, Walworth No. 906-F, Jenkins No. 613, Powell No. 241 or Stockham No. G-512

Item	2" and Smaller	2-1/2" and larger
Check Valves	125lb. WSP screwed pattern, brass or bronze body, brass or bronze disk; Crane No. 36, Walworth No. 420. Jenkins No. 762-A, Powell No. 560Y or Stockham No. B-345	Horizontal: 125lb. WSP, flat face, flanged iron body, swing check, brass or bronze trimmed, ANSI B16.1 flanges; Crane No. 373, Walworth No. 928-F, Jenkins No. 624, Powell No. 559 or Stockham No. G-931 Vertical: 125lb. class silent lift check, semi-steel or ductile iron body; Williams-Hager No. 636, Jenkins No. 777-A or Stockham No. WG-988 or 125lb cast iron dual disk, bronze plates, 316SS pin and spring with Buna-N seals; Metraflex C-125-250, DuoCheck HMP 0r Stockham WG-970
Bolting		Square head machine bolts with heavy hex nuts: ASTM A307 Grade B
Gaskets		Full faces compressed sheet packing
Thread compound	Teflon paste or Teflon tape	150lb. RF flexitallic CGP, 340SS & FF of similar quality

Notes:

A Use flat faced flanges where piping connects to FF equipment or CI flanges.

B Provide similar butterfly valves with gear operators for valve sizes 8” and over

END OF SECTION 15180