

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 21 05 01 - Common Work Results for Mechanical.
- .2 Section 23 05 05 - Installation of Pipe Work.
- .3 Section 23 05 23.01 – Valves – Bronze.
- .4 Section 23 05 23.02 - Valves – Cast Iron.
- .5 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B16.1-2010, Grey Iron Pipe Flanges and Flanged Fittings.
 - .2 ANSI/ASME B16.3-2011, Malleable Iron Threaded Fittings.
 - .3 ANSI/ASME B16.5-2013, Pipe Flanges and Flanged Fittings.
 - .4 ANSI/ASME B16.9-2012, Factory-Made Wrought Butt welding Fittings.
 - .5 ANSI/ASME B18.2.1-2012, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
 - .6 ANSI/ASME B18.2.2-2010, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A47/A47M-99(2014), Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - .3 ASTM A536-84(2014), Standard Specification for Ductile Iron Castings.
 - .4 ASTM B61-08 (2013), Standard Specification for Steam or Valve Bronze Castings.
 - .5 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .6 ASTM E202-12, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.
- .3 American National Standards Institute (ANSI)/ American Water Works Association (AWWA).
 - .1 ANSI/AWWA C111-/A21.11-2012, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA B242-2005 (R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

- .2 CSA W48-2014, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).
- .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-2011, Butterfly Valves.
 - .2 MSS-SP-70-2011, Grey Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-2011, Grey Iron Swing Check Valves Flanged and Threaded Ends.
 - .4 MSS-SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.
 - .5 MSS-SP-85-2011, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal.
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

1.4 MAINTENANCE

- .1 Refer to Section 01 00 10 – General Instructions.
- .2 Extra Materials.
 - .1 Provide following spare parts:
 - .1 Valve seats: one for every ten valves, each size. Minimum one.
 - .2 Discs: one for every ten valves, each size. Minimum one.
 - .3 Stem packing: one for every ten valves, each size. Minimum one.
 - .4 Valve handles: two of each size.
 - .5 Gaskets for flanges: one for every ten flanges.

Part 2 Products

2.1 MATERIAL

- .1 Chilled Water, Hot Water, Glycol, 1035 kPa:
 - .1 NPS 3 and under: Black steel, schedule 40, to ASTM-A53, CD.
 - .2 NPS 4 to NPS 12: Black steel, schedule 40, to ASTM-A53, ERW, grade B
- .2 Chilled Water, Hot Water on typical east and west tower floors only: Hard drawn copper tubing: to ASTM B88L.
- .3 Chilled Water, Hot Water, Glycol, 1035 to 2070 kPa:
 - .1 NPS 3 and under threaded: Black steel, schedule 80 XS, ASTM-A53, CW
 - .2 NPS 2½ to NPS 6: Black steel, schedule 40, ASTM-A53, Grade B, ERW.
 - .3 NPS 8 to NPS 16 and over: Black steel, wall thickness of 12.7mm, ASTM-A53, Grade B, ERW.

2.2 STEEL, 1035 kPa (150 psi) OR LESS

- .1 Pipe joints
 - .1 NPS 2 and under: screwed fittings with lead-free pipe dope.
 - .2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48.
 - .3 Flanges: plain or weld neck to ANSI/AWWA C111.
 - .4 Orifice flanges: slip-on raised face, 2100 kPa.
 - .5 Flange gaskets: to ANSI/AWWA C111.
 - .6 Pipe thread: taper.
 - .7 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.
 - .8 Note: mechanical grooved joints, in accordance with ASTM-A536 for ductile iron or ASTM-A47, gaskets as appropriate for the application at vibrating equipment or as needed for expansion. No mechanical joints are accepted on chilled water and cold glycol distribution elsewhere.
- .2 Fittings
 - .1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
 - .2 Pipe flanges and flanged fittings:
 - .1 Cast iron: to ASME B16.1, Class 125.
 - .2 Steel: to ASME B16.5.
 - .3 Butt-welding fittings: steel, to ASME B16.9.
 - .4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.
- .3 Valves
 - .1 Connections:
 - .1 NPS 2 and smaller: threaded ends.
 - .2 NPS 2.1/2 and larger: Flanged ends.
 - .2 Gate valves: to MSS-SP-70, MSS-SP-80 Application: Isolating equipment, control valves, pipelines
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms : Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 Elsewhere: Class 125, rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.
 - .2 NPS 2 1/2 and over:
 - .1 Mechanical Rooms : rising stem, split wedge disc, bronze trim, as specified - Section 23 05 23.02 - Valves – Cast iron.
 - .2 Elsewhere: rising stem, solid wedge disc, bronze trim, as specified. Section 23 05 23.02 - Valves – Cast iron
 - .3 Butterfly valves:
 - .1 Ductile iron body, aluminum-bronze disc, grooved joints, in accordance with ASTM-A536, 2070 kPa.
 - .2 Cast iron body, bronze disc, 416 stainless steel stem, EPDM replaceable seat.
 - .3 NPS 2½ to NPS 6: position indicator and adjustable stop.

- .4 NPS 8 and over: with wheel and gears, position indicator and adjustable stop.
- .4 Ball valves:
 - .1 NPS 2 and under: brass body, threaded ends, EPDM seat, memory stop.
- .5 Swing check Valves:
 - .1 NPS 2 and under: bronze body, bronze cap, disc and hinge. Replaceable disc, threaded ends.
 - .2 NPS 2½ and over: Victaulic, series 711 or 715, grooved, cast iron body, 3450 kPa, EPDM seat.

2.3 COPPER

- .1 Tubing
 - .1 Hard drawn copper tubing: to ASTM B88.
- .2 Fittings
 - .1 Cast bronze threaded fittings: to ANSI/ASME B16.15.
 - .2 Wrought copper and copper alloy solder joint pressure fittings: to ANSI/ASME B16.22.
 - .3 Cast iron threaded fittings: to ANSI/ASME B16.4.
 - .4 Cast copper alloy solder joint pressure fittings: to ANSI B16.18
- .3 Flanges
 - .1 Brass or bronze: threaded.
 - .2 Cast iron: threaded.
 - .3 Orifice flanges: slip-on, raised face, 2100 kPa.
- .4 Joints
 - .1 Solder, tin-antimony, 95:5: to ASTM B32.
 - .2 Silver solder BCUP: to ANSI/AWS A5.8.
 - .3 Brazing: as indicated.
- .5 Valves
 - .1 Connections:
 - .1 NPS 2 and smaller: ends for soldering.
 - .2 NPS 2 1/2 and larger: flanged or grooved ends.
 - .2 Butterfly valves:
 - .1 NPS 2 1/2 and over: lug type grooved ends
 - .3 Globe valves:
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: with PTFE disc.
 - .2 Elsewhere: globe, with composition disc.
 - .2 NPS 2 1/2 and over:
 - .1 With bronze disc, bronze trim.
 - .4 Swing check valves:
 - .1 NPS 2 and under:
 - .1 Class 125, swing, with composition disc.

- .2 NPS 2 1/2 and over:
- .1 Flanged, Grooved ends.

Part 3 Execution**3.1 PIPING INSTALLATION**

- .1 Install pipework in accordance with Section 23 05 05 - Installation of Pipe Work.

3.2 CIRCUIT BALANCING VALVES

- .1 Install flow measuring stations and flow balancing valves as indicated.
- .2 Remove handwheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.3 CLEANING, FLUSHING AND START-UP

- .1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.4 TESTING

- .1 Test system in accordance with Section 21 05 01 - Common Work Results for Mechanical.
- .2 For glycol systems, retest with ethylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.5 BALANCING

- .1 Balance water systems to within plus or minus 5% of design output.
- .2 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.6 GLYCOL CHARGING

- .1 Provide mixing tank and positive displacement pump for glycol charging.
- .2 Retest for concentration to ASTM E202 after cleaning.

END OF SECTION