
PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. This section of the specifications details the components to be provided by the BMCS subcontractor related to the following:
 - 1. Two-way globe control valves.
 - 2. Two-way ball control valves.
 - 3. Two-way butterfly control valves.
 - 4. Valve actuators.
 - 5. Cooling tower sump makeup.
 - 6. Valves for instrumentation isolation.

PART 2 - PRODUCTS

2.1 VALVES - GENERAL

- A. Furnish all valves controlled by the BMCS as detailed in the Mechanical Documents and as indicated in the Field Termination Schedules. Furnish all shut-off valves for instrumentation as detailed in the BMCS Field Devices - Water section of these specifications. The Mechanical Subcontractor shall install valves. All other valves such as check valves, relief valves, pressure reducing valves, self regulating valves, manually operated valves, etc. shall be furnished and installed by the Mechanical Subcontractor. Provide details of the manufacturer's installation requirements to the Mechanical Subcontractor.
- B. Refer to the Mechanical plans and drawings for the design conditions on which to base sizing and ratings of the valves and their actuators.
- C. Refer to the Mechanical Drawings for pressure zones. All valves shall meet, at minimum, the following ANSI Class ratings:
 - 1. 150 PSI working pressure - ANSI Class 150 ratings.
 - 2. 250 PSI working pressure – ANSI Class 250 ratings.
 - 3. 300 PSI working pressure – ANSI Class 250 ratings.
 - 4. 400 PSI working pressure – ANSI Class 300 ratings.
 - 5. 450 PSI working pressure – ANSI Class 300 ratings.
- D. The complete valve (body and trim) shall be rated for a pressure which is at least 50% greater than the maximum pressure to which it will be exposed or shall be rated for a higher pressure where specifically identified in this Section.
- E. The complete valve shall be rated for a temperature, which shall be at least 90 Deg. F. greater than the maximum temperature to which it will be exposed. The complete valve shall be certified by the manufacturer to be suitable for and to meet all relevant standards for the application.
- F. Provide extended valve stems to allow for the installation of insulation.
- G. Valves of similar types shall be by the same manufacturer.
- H. Valves shall have the manufacturer's name and the pressure rating clearly marked on the outside of the body. Where this is not possible manufacturer's name and valve pressure rating shall be engraved on a minimum 50mm (2 inch) diameter stainless steel tag, which shall be attached to the valve by a chain in such a manner that it cannot be unintentionally removed.
- I. Valves 0.5 inch to 2 inches shall have NPT female screwed ends if suitable pressure ratings can be achieved. Valves 2.5 inches and larger shall have flanged ends. Flanged valves shall be furnished complete with companion flanges, gaskets and bolting materials. Flanges, gaskets and bolting materials shall meet the requirements of ASME/ANSI.

- J. Verify and certify that the materials of construction of the pipe, weld, flange, bolts and valve will not cause any galvanic corrosion.
- K. Where necessary to achieve the required performance and pressure drop a control valve may be sized up to two nominal sizes below line size. Two position valves shall be full line size.
- L. The BMCS subcontractor shall certify that the materials of construction are appropriate for the application.
- M. Valve schedules shall be submitted for review and shall clearly show the following for each valve:
 - 1. Associated system.
 - 2. Valve manufacturer and model number.
 - 3. Valve size and lines size.
 - 4. Valve authority, flowrate at design conditions across the associated mechanical equipment, e.g, coil, heat exchanger, etc., at design conditions.
 - 5. Valve configuration (e.g. two way, three way, butterfly).
 - 6. Leakage rate.
 - 7. Maximum pressure shut-off capability.
 - 8. Actuator manufacturer and model number.
 - 9. Valve body pressure and temperature rating.
 - 10. Normally open/closed and failure positions.

2.2 TWO WAY GLOBE CONTROL VALVES

- A. Provide two-way globe control valves at the following locations as identified in the Field Termination Schedules:
 - 1. Chilled water coils.
- B. Two way control valves shall meet, at minimum, the following requirements:
 - 1. Valves shall be selected such that the valve authority (N) shall not be less than 0.5 as defined by the relationship:
$$N = P1 / (P1 + P2)$$
where P1= pressure drop across the fully open valve, and P2= pressure drop across the remainder of the circuit (e.g. a coil).
 - 2. Capable of tight shut-off when operating at system pressure with the system pump operating at shut-off head. Leakage rate shall not exceed 0.01% of the rated valve capacity (ANSI Class 4) at pump shut-off head.
 - 3. Straight pattern type. Angle valves shall only be furnished where the piping configuration does not permit the use of a straight valve.
 - 4. Valve shall be single seat globe type. Double seat valves shall not be furnished.
 - 5. Valve shall have equal percentage or linear flow characteristics as appropriate for the application. Typically linear valves shall be used for chilled water control.
 - 6. Suitable for continuous throttling.
 - 7. Valve body material shall be bronze, cast iron, or carbon steel subject to requirements for valve body pressure and temperature rating and suitability of material for application.
 - 8. Valve trim shall be stainless steel.
 - 9. Valve seats shall be metal equivalent and must assure tight seating.
- C. Where necessary to achieve the required performance and pressure drop a control valve may be sized up to two nominal sizes below line size.
- D. Valves shall be manufactured by Belimo, Fisher, Dezurik, Warren, or approved equal.

2.3 TWO WAY BALL CONTROL VALVES

- A. Two-way characterized ball control valves may be utilized in lieu of globe control valves for the locations identified in the section above provided characterized ball valves are utilized for all globe valve locations.
- B. Provide two way ball control valves at the following locations as identified in the Field Termination Schedules:
 - 1. FCU heating coils.

2. FPTU heating coils.
 3. AHU overhead zone heating coils.
 4. Radiant floor valves.
- C. Two way ball control valves shall meet, at minimum, the following requirements:
1. Valves shall be selected such that the valve authority (N) shall not be less than 0.5 as defined by the relationship:
 $N = P1 / (P1 + P2)$, where P1= pressure drop across the fully open valve, and P2= pressure drop across the remainder of the circuit (e.g. a coil).
 2. Capable of tight shut-off when operating at system pressure with the system pump operating at shut-off head. Leakage rate shall not exceed 0.01% of the rated valve capacity (ANSI Class 4) at pump shut-off head.
 3. Rated for the operating pressure of the system.
 4. A flow-characterizing disc shall be installed in the inlet of a 2-way characterized control valves.
 5. Equal percentage flow characteristics.
 6. Maximum allowable pressure differential shall be 50 psi.
 7. Close off pressure rating of 200 psi.
 8. Suitable for continuous throttling.
 9. Valve body material shall be nickel plated forged brass.
 10. Ball and stem shall be stainless steel.
 11. Valve seats and seals shall be fiberglass reinforced Teflon or equivalent and must assure tight seating.
 12. Stem packing shall be double EPDM O-ring seals.
 13. Full port or reduce port as required by the application.
 14. Valve shall be manufactured by Belimo or approved equal.
- D. Where necessary to achieve the required performance and pressure drop a control valve may be sized up to two nominal sizes below line size.

2.4 BUTTERFLY VALVES

- A. Provide butterfly valves at the following locations as identified in the Field Termination Schedules:
1. Heat exchanger isolation.
 2. Chiller flow control.
 3. Cooling tower isolation.
 4. Condenser water bypass.
 5. Chilled water bypass.
 6. Boiler flow control.
 7. Hot water bypass.
 8. Condenser water treatment side stream.
 9. Cooling tower filtration isolation.
- B. Butterfly valves shall meet, at minimum, the following requirements:
1. Full lugged type. Semi-lug and wafer valves are not acceptable.
 2. Two position valves shall be full line size.
 3. Modulating valves shall be selected such that the valve authority (N) shall not be less than 0.5 as defined by the relationship:
 $N = P1 / (P1 + P2)$, where P1= pressure drop across the fully open valve, and P2= pressure drop across the remainder of the circuit (e.g. a coil). Where necessary to achieve the required performance and pressure drop a control valve may be sized up to three nominal sizes below line size
 4. Valve body shall be one of the following:
 - a. Stainless steel.
 - b. Carbon steel.
 - c. Nickel aluminum bronze.
 5. Disc shall be one of the following:
 - a. 316 stainless steel.
 - b. Monel.
 6. Stem shall be one of the following:
 - a. 316 stainless steel.

- b. 17-4PH stainless steel.
 7. Seat shall be replaceable and shall be one of the following:
 - a. Polymer (PTFE)
 - b. 316 stainless steel
 - c. Resilient elastomer (EPDM)
 - d. Monel
 8. Seat retaining ring shall be one of the following:
 - a. Stainless steel.
 - b. Nickel aluminum bronze.
 9. Stem packing shall be one of the following:
 - a. PTFE.
 - b. Graphite.
 10. Stem bearing shall be stainless steel.
 11. Thrust washers and other trim shall be stainless steel.
- C. The butterfly valve manufacturer shall certify compliance with ANSI Class 5 bubble tight shut-off requirements at a differential pressure not less than the full rated design working pressure and temperature specified with the downstream flange removed with flow in either direction.
- D. Valve manufacturer shall guarantee zero leakage to the shaft.
- E. Where indicated in the Mechanical Drawings provide linked butterfly valves that shall comprise two butterfly valves meeting the above requirements mounted on a flanged tee with a single actuator which shall modulate one valve open as it closes the other such that when one is fully open the other is fully closed and vice versa.
- F. Butterfly Valves shall be manufactured by Tyco K-LOK 362/372 or approved equal.

2.5 TWO WAY BALL CONTROL VALVES – COOLING TOWER FILTRATION

- A. Two way ball control valves shall meet, at minimum, the following requirements:
1. Valves shall be line size.
 2. Capable of tight shut-off when operating at system pressure with the system pump operating at shut-off head. Leakage rate shall not exceed 0.1% of the rated valve capacity (ANSI Class 3) at pump shut-off head.
 3. Close off pressure rating of 200 psi.
 4. Valve body material shall be bronze.
 5. Ball and stem shall be stainless steel.
 6. Valve shall be manufactured by Belimo or approved equal.

2.6 VALVE ACTUATORS - ELECTRIC

- A. The BMCS subcontractor shall provide actuators for all control valves that are furnished as part of the BMCS contract. Two way and three way control valve actuators shall meet, at minimum, the following requirements:
1. Motor driven type. Valve stem position shall be adjustable in increments of one (1) percent or less of full stem travel.
 2. Rated for continuous duty against the maximum system operating pressure. Actuator shall have an input voltage of 24 VAC.
 3. Exterior housings shall be NEMA-4 rated or mounted within NEMA-4 enclosure.
 4. Provide one actuator per valve sized to meet the shut-off requirements when operating at the maximum system differential pressure and with the installed system pump operating at shut-off head. Actuators shall control against system maximum working pressures. Stacked actuators shall not be acceptable.
 5. Normal and failure positions shall be as indicated in the Operating Sequences.
 6. The valve stem position shall be linearly related to the control signal.
 7. Visual mechanical position indication, showing valve position.
 8. Capable of operating the valve from the fully closed to the fully open position and vice versa in less than two minutes.
 9. Equipped with an integral position potentiometer to indicate the stem position of the valve if required by the sequence of operation.

10. Manual declutch lever to enable manual operation of the valve
 11. Floating actuators shall not be permitted.
 12. Actuator shall be manufactured by Belimo or approved equal.
- B. The BMCS subcontractor shall provide electric actuators for all butterfly valves provide as part of the BMCS contract. The butterfly control valve actuators shall meet the following requirements:
1. Motor driven type. Valve stem position shall be adjustable in increments of one (1) percent or less of full stem travel.
 2. Integral self-locking gear train, mechanical travel stops and two adjustable travel limit switches with electrically isolated contacts. Gear assembly shall be made of hardened steel. No plastic components shall be acceptable.
 3. Rated for continuous duty and have an input voltage of 120 VAC.
 4. Housing shall be NEMA 4 rated.
 5. Provide one actuator per valve sized to meet the shut-off requirements when operating at the maximum system differential pressure and with the installed system pump operating at shut-off head. Actuators shall control against system maximum working pressures.
 6. Valves shall fail as in the last commanded position or as indicated in the Operating Sequences.
 7. Visual mechanical position indication, showing valve position.
 8. Capable of operating the valve from the fully closed to the fully open position and vice versa in less than two minutes.
 9. Equipped with an integral position potentiometer to indicate the stem position of the valve if required by the sequences of operation.
 10. Provided with anti-condensation heaters for exterior applications.
 11. Provide for the manual modulation of the valve in the event of loss of power or BMCS component failure via mechanical hand wheel.
 12. Floating actuators shall not be permitted.
 13. Actuator shall be Keystone Series 777 or approved equal.

2.7 INSTRUMENTATION ISOLATION VALVES

- A. Instrumentation, such as pressure sensors and flow rate monitors, which is provided for the monitoring of parameters associated with liquid in pipes or tanks, shall be removable and replaceable without the requirement to shut down a pump and without the requirement to drain the pipe or tank and without causing liquid to leak from the pipe or tank. To facilitate this, the BMCS subcontractor shall furnish valves for installation by the Mechanical subcontractor.
- B. Instrumentation which is mounted external to the pipe or tank and which is connected to the pipe or tank by one or more sampling lines shall have a manual two-way on/off valve in each sampling line meeting the following requirements:
1. Ball type valve
 2. Valve body shall be 316 stainless steel
 3. Ball and stem shall be 316 stainless steel
 4. Zero leakage.
 5. Rated for 600 psi.
 6. Rated for a minimum of 90 Deg. F. greater than the highest fluid temperature.
 7. Valve seats shall be metal must assure tight seating.
 8. Valve shall be Whitey 40 Series or 80 Series or approved equal.
- C. Valves for insertion flowmeters shall be full port gate valves sized for the flowmeter in accordance with the flowmeter manufacturer's instructions. If the flowmeter manufacturer offers the valve as an accessory then it shall be purchased by the BMCS subcontractor from the insertion flowmeter manufacturer and shall be installed by the mechanical trade in accordance with the insertion flowmeter manufacturer's instructions. The valve shall meet the pressure and temperature requirements detailed for the control valves and shall have zero leakage at the system maximum pressure.

END OF SECTION