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BuildingName
The Description of the Project
P00000000 0000

SPECIFICATION DIVISION 22

NUMBER SECTION DESCRIPTION

DIVISION 22
SECTION 220523 - VALVES

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DIVISION 22
SECTION 220523 - VALVES

REVISIONS:

2015-06-30: CLARIFIED THAT GROOVED BUTTERFLY VALVES ARE ONLY PERMITTED WHEN SPECIFICALLY INDICATED, H.P. BUTTERFLY VALVES ARE REQUIRED OTHERWISE, INCLUDING IN GROOVED PIPING. D. KARLE FOR PLMG. MTT.

2017-02-08: ADDED APPROVED MFRS - ABZ FOR HP B'FLY, VANESSA FOR METAL SEATED B'FLY AND APOLLO FOR GATE/GLOBE/CHECK. B. BEGG FOR PLMG. MTT.

APRIL 2018: REVISED TO LIST MFR.S FROM PML. R BENEDEK

OCTOBER 2026: REMOVED ANNEX F AND ANNEX G REFERENCES (ANNEXES ARE INCLUDED WITH STANDARDS). REMOVED JOMAR BRONZE BALL VALVES. ADDED MILWAUKEE VALVE COMPANY HIGH PERFORMANCE METAL TO METAL SEATED BUTTERFLY VALVES.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

INCLUDE PARAGRAPH 1.1.A AND B IN EVERY SPECIFICATION SECTION. EDIT RELATED SECTIONS 1.1.B TO MAKE IT PROJECT SPECIFIC.

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections including the Related Sections listed below, apply to this Section.

B. Related sections:

1. 220500 Common Work Results for Mechanical
2. 221113 Piping Materials & Methods
3. 331100 Water Distribution Piping
4. 336300 Steam and Condensate Distribution Systems

1.2 SCOPE OF WORK:

A. Provide valves as scheduled and specified for the following systems:

1. Cold Water, Hot Water, Hot Water Return
2. High Purity Water
3. Compressed Air
4. Lab Vacuum
5. Natural Gas
6. Hot Water Heating, Chilled Water, Condenser Water
7. Steam and Condensate
8. Others as indicated
9. Refer to 336300 for steam and condensate valves in the utility tunnels.

1.3 QUALITY ASSURANCE:

A. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.

B. Reference Standards: Products in this section shall be built, tested, and installed in compliance with the specified quality assurance standards; latest editions, unless noted otherwise.

1. National Sanitation Foundation NSF/ANSI-61 (listed as ≤ 0.25% weighted average lead content)(and/or NSF/ANSI-372). Applies to any item in contact with domestic (potable) water.
2. U.S Safe Drinking Water Act (any item in contact with domestic (potable) water).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials and accessories raised off the floor or ground on pallets and protected with coverings to prevent damage or contamination due to weather and construction activities. Provide temporary protective caps on pipe ends. Maintain caps installed at all times until just prior to assembly, and recap open pipe ends at the conclusion of each work day. Store in areas that prevent damage due to freezing and extreme temperatures or sunlight. Arrange coverings to provide air circulation to avoid damage from condensation or chemical build-up. Protect from damage, dirt and debris at all times.

PART 2 - -PRODUCTS

2.1 VALVE APPLICATION SCHEDULE:

SPEC EDITOR: EDIT 2.1 CAREFULLY TO SUIT PROJECT. CONSIDER USE OF LESS EXPENSIVE STANDARD BUTTERFLY VALVES FOR CW, HW, CHW AND HWH. COORDINATE VALVE SELECTION WITH PLANT. ADD SOLENOID VALVES UNDER SPECIALTY VALVES IF APPLICABLE, CONSIDER USE OF GROOVED BUTTERFLY VALVES. EDIT BALANCING VALVES TO SUIT PROJECT.

A. Cold Water, Hot Water and Hot Water Return System:

Isolation through 2": Ball Valve
Isolation 2 1/2" and larger: High Performance Butterfly Valve, All stainless steel.
Check: Swing Check through 2", Silent Check for 2 1/2" and up.
Balancing: Automatic Balancing Valve, Manual Balancing Valve

SPEC EDITOR: REFER TO SPEC SECTION 331100 FOR VALVES IN UTILITY TUNNELS.

SPEC EDITOR: ADD/ DELETE SPECIALTY VALVES IF APPLICABLE

Specialty Valves:

B. High Purity Water Systems (deionized, reverse osmosis, distilled):

Isolation through 2": High Purity Water Ball Valve

C. Compressed Air System,
Lab Vacuum System:

Isolation through 2": Ball Valve
Isolation 2 1/2" and larger: High Performance Butterfly Valve
Check: Swing Check Valve

D. Natural Gas System:

Isolation through 2": Ball Valve certified by UL or CSA for natural gas.
Isolation 2 1/2" and larger: Lubricated Plug Valve (Section 231123)

SPEC EDITOR: INSERT BELOW, THE REQUIREMENT FOR UNDERGROUND CHILLED WATER VALVES. IF INCLUDED IN A SEPARATE SPECIFICATION SECTION FOR UNDERGROUND CHW PIPING, REFERENCE THAT SPEC. SECTION.

E. Hot Water Heating System,
Chilled Water System,
Condenser Water System:

Isolation through 2": Ball Valve
Isolation 2 1/2" and larger: High Performance Butterfly Valve
Isolation - Underground chilled water:
Check: Swing Check through 2", Silent Check for 2 1/2" and up.
Balancing: Automatic Balancing Valve, Manual Balancing Valve

F. Steam and Condensate System through 60 psig (refer to 336330 for steam and condensate valves in the utility tunnels).

SPEC EDITOR: ON STEAM SYSTEMS, A WARM-UP BYPASS VALVE SHOULD BE INSTALLED ON SIZES 8" AND LARGER

METAL-TO-METAL BUTTERFLY VALVES ARE SPECIFIED FOR ALL STEAM SYSTEMS 2-1/2" AND LARGER, BASED ON THE ASSUMPTION THAT MOST STEAM SYSTEMS IN BUILDINGS ARE CONNECTED TO THE CENTRAL CAMPUS UTILITY TUNNEL SYSTEM AND SHOULD BE RATED FOR 600°F. IF YOUR PROJECT DOES NOT USE STEAM FROM THE UTILITY TUNNEL SYSTEM, A HIGH PERFORMANCE BUTTERFLY VALVE (RATED 150 PSIG/450°F) IN LIEU OFA METAL-TO-METAL MAY BE MORE APPROPRIATE; EDIT SPEC ACCORDINGLY.

Isolation through 2": Ball Valve
Isolation 2 1/2" and larger: Metal-to-Metal Seated Butterfly Valve
Check (condensate only): Swing Check through 2", Silent Check for 2 1/2" and up.

2.2 GENERAL VALVE REQUIREMENTS:

A. All valves shall have seats, stem seals and disc materials compatible with intended fluid, temperature, pressure and service.

B. All EPDM shall be peroxide cured. All wetted seals shall be made from materials that are immune from chloramine degradation.

C. Valves in contact with domestic (potable) water shall be "lead free" NSF/ANSI-61 (and/or NSF/ANSI-372) labeled. Soldered lead free valves (all types) are restricted to use on domestic potable water systems only.

D. Manually operated valves 4" and larger installed 10 feet A.F.F., or higher, shall have chain wheel operators.

E. Gate and globe valves shall be repackable under pressure whether open or closed.

F. Unless noted otherwise, valves shall be rated for a minimum of 125# WSP (working steam pressure)/ 250# WOG (cold water, oil, gas).

G. Unless noted otherwise, all butterfly valves shall be full lug construction, suitable for bi-directional dead end service, and have open position memory stop. Manually operated butterfly valves 4" and larger shall have enclosed worm gear operators with position indicators.

H. Provide extended valve stems for insulated piping.

I. Where the valves are installed outdoors, all components including the gear operated wheel operators shall be weatherproofed.

J. Unless noted otherwise, valves through 2" shall have screwed connections for steel piping and sweat connections for copper piping; valves 2-1/2" and larger shall be flanged.

K. Unless noted otherwise, valves shall be same size as piping.

2.3 BALL VALVE:

A. Two-piece, full port, bronze body, stainless steel ball and stem, Teflon seat, plastic coated lever handle and locking devices where noted in drawings.

1. Valves for Natural Gas shall be UL or CSA approved for natural gas service.

B. Manufacturers: Watts, Nibco, Apollo, Milwaukee, Hammond.

2.4 HIGH PERFORMANCE BUTTERFLY VALVE:

SPEC EDITOR: STANDARD FOR MOST ISOLATION VALVES 2 1/2" AND LARGER. NOTE, STANDARD BUTTERFLY VALVES ARE NOT TYPICALLY ACCEPTABLE, AND HAVE BEEN REMOVED FROM THIS MASTER SPECIFICATION.

A. Full lug, high performance type, carbon steel body, 316 stainless steel disc, stainless steel shaft and bearing, PTFE/RTFE seat, Teflon stem packing. Rated for 150 psi, 450 degrees F.

SPEC EDITOR: BRAY AND PRATT HAVE NOT BEEN APPROVED FOR CENTRAL POWER PLANT PROJECTS. PRATT HP SERIES HAS BEEN TESTED FROM FEB 2021 TO SEPT 2022 AND APPROVED FOR NON-CPP PROJECTS.

B. Manufacturers: Bray – Braylok Series 41, Dezurik - BHP, Jamesbury - 815L, Milwaukee - HP Series, Tri-Seal Valve-Contromatics (formerly Watts/KF Contromatics), Xomox Pliaseal, ABZ ABZolute Seal Series 400, Pratt

C. For domestic water systems, full lug, high performance type, 316 stainless steel body, 316 stainless steel disc, stainless steel shaft and bearing, (all wetted parts stainless steel) PTFE seat, Teflon stem packing. Rated for 150 psi, 250 degrees F.

2.5 BUTTERFLY VALVE - GROOVED:

SPEC EDITOR: FOR USE WITH GROOVED PIPING, NOT OUR STANDARD, USE ONLY UNDER SPECIAL CONDITIONS. NORMALLY HIGH PERFORMANCE BUTTERFLY VALVES ARE TO BE USED, EVEN IN GROOVED PIPING SYSTEMS, THEREFORE THIS SECTION SHOULD BE DELETED IN MOST CASES. SELECT APPLICABLE SECTION BELOW IF USED. NOT FOR USE IN TUNNELS

A. Grooved ductile iron body, suitable for installation with grooved piping, EPDM coated steel disc and shaft, stainless steel hub bearing, EPDM seat, Teflon stem packing. Rated for 300 psi, 230 degrees F.

Manufacturer: Victaulic Vic-300

B. Grooved Nylon coated ductile iron body, EPDM coated ductile iron disc, stainless steel shaft, bronze shaft bearing. MSS SP-67

Manufacturer: Anvil Gruvlock Series 7700.

C. Grooved butterfly valves may be used only within grooved piping systems and only when specifically noted as permitted on the project drawings. Otherwise, high performance butterfly valves shall be provided, including for grooved piping systems.

2.6 HIGH PERFORMANCE METAL-TO-METAL SEATED BUTTERFLY VALVE:

A. Full lug or short body flanged for end-of-line dead end service, bi-directional shutoff, triple offset type, single piece carbon steel body per ANSI B16.5 flange dimensions, carbon or stainless steel hardened abrasion-resistant disc keyed to stem with self-centering feature, stainless steel stem, hardened heavy duty stainless steel bearings with line debris ingress protection feature, stainless steel or Inconel seat and seal, bolted replaceable elastically resilient seal, high-temp graphite stem packing with blow-out proof design and adjustable gland. Pressure Class 150 rated for 140 psig, 600 degrees F. per ANSI/ASME B16.34. Valve tested for minimum 5000 cycles, with initial bubble-tight, zero leakage closure classification per FCI 70-2 or equivalent testing and fabricated per ISO 9001 QA program protocols. Operator to be lockable, low operational torque fully enclosed lifetime lubricated worm gear type, keyed to shaft with local position indicator, size based on seating and break away safety factor. Valve warranty shall be 36 months from substantial completion. Mounting taps to be tapered to aide bolt threading. Body to have quantity (4) tapped holes equally spaced around the body for mounting threaded lifting lugs to aide installation.

B. Valve Flow Capacity: The minimum Cv value for various valve sizes in the full open position shall be as follows:

1. 4 inch: 230
2. 6 inch: 660
3. 8 inch: 1500

4. 10 inch: 2400
5. 12 inch: 3600
6. 14 inch: 5500
7. 16 inch: 7600
8. 18 inch: 10300
9. 20 inch: 13000
10. 24 inch: 20200

C. Manufacturers: Bray Trilok, Metso/Neles Neldisc, Adams MAK, ABZ Extreme 6000 Series, Vanessa, Weir Tricentric, Zwick Tri-Con, Milwaukee Valve Company, Crane ChemPharma & Energy.

2.7 GATE VALVE - (FOR 2" AND SMALLER ONLY):

A. General Service: Bronze body and trim, screwed, rising stem. de-zincification resistant.

1. Description:
   a. Standard: MSS SP-80
   b. CWP Rating: 300 psig
   c. SWP Rating: 150 psig
   d. Body Material: Bronze ASTM B 62
   e. Ends: Threaded
   f. Stem: Silicon Bronze
   g. Disc: Solid wedge, Bronze ASTM B 62
   h. Packing: Asbestos free
   i. Bonnet: screw in style, Bronze ASTM B 62
   j. Handwheel: Malleable Iron
   k. For domestic water service: Per above, accept with non-rising stems and rated 200 psig CWP at 300°F. Solder end connections to 3/4 inch size, threaded ends for 1 inch and above.
2. Manufacturers: Nibco T-131 (T/S-113-LF lead free), Apollo, Crane, Grinnell, Stockham, Watts, Milwaukee, Hammond

2.8 SWING CHECK VALVE:

SPEC EDITOR: TYPICALLY USED FOR ALL SERVICES, 2" AND UNDER, SWING CHECK VALVES ARE NOT ACCEPTABLE FOR UTILITY TUNNELS

A. Bronze body and trim.

B. Minimum pressure of 200# WOG (cold water, oil, gas).

C. Manufacturers: Milwaukee model 509, Crane model 37, Grinnell model 3300, Nibco, Apollo

2.9 SILENT CHECK VALVE:

SPEC EDITOR: TYPICALLY USED FOR ALL SERVICES, 2 1/2" AND OVER

A. Spring loaded type check valves, stainless steel spring, iron body, and bronze trim.

B. Minimum pressure of 200# WOG (cold water, oil, gas).

C. Manufacturers:

1. Wafer Style: Milwaukee - Series 1400, APCO - Series 300, Mueller, Metraflex.

2. Globe Style: Milwaukee, APCO, Mueller, Metraflex, Apollo
3. Condensate pump and pressure powered pump discharge: Durabula model SCV, stainless body

2.10 DRAIN VALVE:

A. General Service: Ball valve with 3/4-inch hose threaded end fitting and cap.

2.11 AUTOMATIC BALANCING VALVE:

SPEC EDITOR: THIS SECTION STILL NEEDS SOME WORK - EDIT CAREFULLY

A. Automatic flow control, pressure independent type, +/- 5 percent accuracy. 304 stainless steel cartridge, two P/T ports for flow reading. Valve size shall match pipe size. Refer to drawings for flow and pressure range.

B. Manufacturers: Griswold, Autoflow, Bell and Gossett

2.12 MANUAL BALANCING VALVES:

SPEC EDITOR: THIS SECTION STILL NEEDS SOME WORK - EDIT CAREFULLY

A. General Manual Balancing Valve Requirements: ports for measuring flow, memory stop, bubble tight shut-off, valve Cv characteristics suitable for throttling. Size valves to produce a readable design flow (within 10 percent accuracy) and have no more than a max. pressure drop of 3 feet.

B. Through 2": bronze body, brass ball, calibrated.
Manufacturers: Bell & Gossett Circuit Setter Plus, Armstrong, Flow Design Inc., TACO, Victaulic

C. Valves 2-1/2"and larger: cast iron body, brass ball or bronze disc, TFE seat rings, bronze seat, and stainless steel stem.
Manufacturers: Bell & Gossett Circuit Setter, Armstrong, Flow Design Inc., TACO, Victaulic

SPEC EDITOR: VERIFY PRESSURE DROPS AT DESIGN FLOWS AND INSURE THEY ARE MEASURABLE, IF NOT USE THE FOLLOWING.

D. Venturi Style: bronze body, brass ball, and venturi flow measuring station. Manufacturers: Preso B Plus, Accusetter

E. Provide gauge kit for projects requiring over 20 balancing valves. Gauge kits shall be capable of directly reading GPM, or shall include conversion chart from Cv and pressure.

2.13 HIGH PURITY WATER VALVE:

A. Union body ball valve with Teflon seat and viton stem packing. Construction, material, pipe connections and size to match piping.

B. Manufacturers: Harvel Plastics, Hayward, Watts

2.14 SOLENOID VALVES:

A. Full port, bronze body, malleable iron coil enclosure, stainless steel plunger, valve stem, bonnet tube, and spring, Buna-N seal, rated for 500 psi. See drawings for voltage, size and position (NC or NO).

B. Manufacturer: Magnetrol Figure No. 200-A, ASCO, Skinner

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

3.2 GENERAL VALVE INSTALLATION REQUIREMENTS:

A. Install valves such that operator is completely operable, and the valve position indicator is discernible from the floor.

B. Install valves with chain operators such that the chain hangs freely and shall reach to within 7'-0" of floor or operating platform, or within two feet of accessible ceiling.

3.3 SOLENOID VALVE INSTALLATION REQUIREMENTS:

A. Provide a strainer before each solenoid valve. Provide a water hammer arrestor upstream of solenoid valves used for water service.

3.4 NATURAL GAS VALVE INSTALLATION REQUIREMENTS:

A. Install valves in accessible locations, protected from physical damage. Do not locate valves in plenum ceilings.

B. Install isolation valve upstream and within 6 feet of gas appliance. Install a union or flanged connection downstream from the valve to permit removal of controls.

END OF SECTION 220523