SECTION 40 05 51
VALVES: BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Valving, actuators, and valving appurtenances.

B. Related Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 01 61 03 - Equipment: Basic Requirements.
4. Section 40 05 00 - Pipe and Pipe Fittings: Basic Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. American Society of Mechanical Engineers (ASME):
   a. B1.20.1, Pipe Threads, General Purpose.
   b. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
   c. B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASTM International (ASTM):
   a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   b. D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
   c. D638, Standard Test Method for Tensile Properties of Plastics.
   d. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
   e. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
   f. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
3. American Water Works Association (AWWA):
   a. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.

b. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
c. C504, Standard for Rubber-Seated Butterfly Valves.
d. C507, Standard for Ball Valves, 6 IN through 48 IN (150 MM through 1200 MM).
e. C509, Standard for Resilient-Seated Gate Valves for Water Supply Service.
f. [C541, Standard for Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates.]
g. [C542, Standard for Electric Motor Actuators for Valves and Slide Gates.]
h. C550, Standard for Protective Coatings for Valves and Hydrants.
i. C606, Standard for Grooved and Shouldered Joints.

4. American Water Works Association/American National Standards Institute (AWWA/ANSI):
   a. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. National Electrical Manufacturers Association (NEMA):
   a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   b. MG 1, Motors and Generators.
6. National Fire Protection Association (NFPA):
   a. 70, National Electrical Code (NEC).

1.3 DEFINITIONS

A. The following are definitions of abbreviations used in this Specification Section or one (1) of the individual valve sections:
   1. CWP: Cold water working pressure.
   2. SWP: Steam working pressure.
   3. WOG: Water, oil, gas working pressure.
   4. WWP: Water working pressure.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:

a. Acknowledgement that products submitted meet requirements of standards referenced.
b. Manufacturer's installation instructions.
c. Valve pressure and temperature rating.
d. Valve material of construction.
e. Special linings.
f. Valve dimensions and weight.
g. Valve flow coefficient.
h. Wiring and control diagrams for electric or cylinder actuators.
i. Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations per Section 01 61 03.

3. Test reports.

B. Contract Closeout Information:

1. Operation and Maintenance Data:

a. See Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

C. Informational Submittals:

1. Verification from valve actuator manufacturer that actuators have been installed properly, that all limit switches and position potentiometers have been properly adjusted, and that the valve actuator responds correctly to the valve position command.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, refer to individual valve Specification Sections for acceptable manufacturers.

2.2 MATERIALS

A. Refer to individual valve Specification Sections.

2.3 VALVE ACTUATORS

A. Valve Actuators - General:

1. Provide actuators as shown on Drawings or specified.
2. Counter clockwise opening as viewed from the top.
3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum pressure rating of the valve provided and withstand without damage a pull of 200 LB on handwheel or chainwheel or 300 FT-pounds torque on the operating nut.
5. Unless otherwise specified, actuators for valves to be buried, submerged or installed in vaults or manholes shall be sealed to withstand at least 20 FT of submergence.
6. Extension stem:
   a. Install where shown or specified.
   b. Solid steel with actuator key and nut, diameter not less than stem of valve actuator shaft.
   c. Pin all stem connections.
   d. Center in valve box or grating opening band with guide bushing.

B. Buried Valve Actuators:
1. Provide screw or slide type adjustable cast iron valve box, 5 IN minimum diameter, 3/16 IN minimum thickness, and identifying cast iron cover rated for traffic load.
2. Box base to enclose buried valve gear box or bonnet.
3. Provide 2 IN standard actuator nuts complying with AWWA C500, Section 3.16.
4. Provide at least two (2) tee handle keys for actuator nuts, with 5 FT extension between key and handle.
5. Extension stem:
   a. Provide for buried valves greater than 4 FT below finish grade.
   b. Extend to within 6 IN of finish grade.
6. Provide concrete pad encasement of valve box as shown for all buried valves unless shown otherwise.

C. Plastic Valve Vault:
1. Provide in non-traffic areas only on valve applications 3-1/2 IN and less.
2. Nominal 7-1/2 IN DIA top section.

3. Design unit for screw type extension section having nominal 9 IN DIA bell.
4. Cast iron ring and lid.
5. Constructed of injection molded polyolefin compound with fibrous inorganic component reinforcing and UV stabilization.
6. Armor Access Boxes.

D. Exposed Valve Manual Actuators:
1. Provide for all exposed valves not having electric or cylinder actuators.
2. Provide handwheels for gate and globe valves.
   a. Size handwheels for valves in accordance with AWWA C500.
3. Provide lever actuators for plug valves, butterfly valves and ball valves 3 IN DIA and smaller.
   a. Lever actuators for butterfly valves shall have a minimum of 5 intermediate lock positions between full open and full close.
   b. Provide at least two (2) levers for each type and size of valve furnished.
4. Gear actuators required for plug valves, butterfly valves, and ball valves 4 IN DIA and larger.
5. Provide gearing for gate valves 20 IN and larger in accordance with AWWA C500.
6. Gear actuators to be totally enclosed, permanently lubricated and with sealed bearings.
7. Provide chain actuators for valves 6 FT or higher from finish floor to valve centerline.
   a. Cadmium-plated chain looped to within 3 FT of finish floor.
   b. Equip chain wheels with chain guides to permit rapid operation with reasonable side pull without "gagging" the wheel.
   c. For smaller valves with lever or handle operators, provide offset tee handles with attached chain for operation from the operating floor.
8. Provide cast iron floor stands where shown on Drawings.
   a. Stands to be furnished by valve manufacturer with actuator.

b. Stands or actuator to include thrust bearings for valve operation and weight of accessories.

E. Submerged Actuators:

1. Mount the valve actuator on top of an extension bonnet 3 FT above any adjacent personnel access.
2. The valve and bonnet connection shall be flanged and watertight.
3. Provide a top brace support for the bonnet.
   a. Mount the brace 6 IN below the top of the wall as shown.
4. Materials:
   a. Extension bonnet: Cast iron ASTM A126 or steel.
   b. Brace and anchor bolts: Type 304 stainless steel.

F. Electric Actuators (120 V, 1 PH):

1. General:
   a. Conform to AWWA C542.
   b. Self-contained including motor, gearing, torque switch, limit switches and cast housing.
   c. Electrical enclosure: NEMA 4 or NEMA 7 to comply with area rating classification shown on Drawings.
   d. Factory assembled requiring only field connection of power and control wires.
   e. Comply with Section 01 61 03.
2. Motors:
   a. Produce 1.5 times the required torque.
   b. Sized for two (2) complete open-close cycles without overheating.
   c. One (1) fully closed to fully open cycle to occur within 60 SEC.
   d. Class F insulation.
   e. Operate at plus or minus 10 PCT voltage.
   f. 120 Volt, single phase, 60 Hz.
   g. Provide thermal cutout switch and internal heater for actuator enclosure.
   h. Control wiring as shown on drawing control diagrams.
3. Remote pushbutton station:
   a. Enclosure: NEMA 4 stainless steel.
   b. Control relays shall include:

1) Open relay.
2) Closed relay.
3) PLC interface relay.

c. Push-to-test indicating lights shall include:
1) Open.
2) Closed.
3) Remote.

d. Selector switches shall include:
1) Local-Remote.
2) Open-Close.

e. Space heater for enclosure.

f. Control wiring as shown on control diagrams.

g. Wire all components to an internal terminal strip and include mounted wiring diagram inside enclosure.

4. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes. See Section 01 61 03 for information on how to determine the available fault current, such that, the SCCR rating meets or exceeds the available fault current.

G. Cylinder Actuators:

1. General:

a. Self-contained unit including actuator and controls.

b. Electrical enclosure to meet area classification shown on Drawings.

c. Factory assembled requiring field supply connection and control wires.

2. Cylinders:

a. Conform to AWWA C541 cylinders.

b. Cylinder barrel: Stainless steel.

c. Heads and caps: [Bronze] [Suitable nonmetallic material] [Ductile iron].

d. Cylinder pistons: Bronze.

e. Double acting and operate on 60 PSIG water or air supply.

f. Cylinder rated for 150 PSIG.

g. Any hoses between control and cylinder to be oil resistant and arranged to avoid sharp bending from hose weight.

h. Provide supply filter.

i. Position cylinder above or to side of valve.

j. For pneumatically operated pump check service provide air-oil tandem cylinder actuator with speed control valves on oil cylinder.

3. Controls:

a. Provide pre-piped, pre-wired control:

1) Pipe with corrosion-resistant metal.

2) Provide four-way, two-position, 110 V solenoid valve in weatherproof enclosure.

3) Provide open-closed signal limit switches.

4) Speed control valves, to independently control opening and closing speed between 10 and 60 SEC.

5) Manual-automatic selector valve on supply to solenoid.

6) For modulating valves, provide a positioner, input signal 4-20 mA, including signal converter.

7) For modulating valves, provide valve position transmitter, 4-20 mA, including signal converter, where shown.

8) For pump check valves, provide additional two-way solenoid valve with speed control to allow rapid close on loss of electric power.

H. Valve Lockout Devices:

1. Device manufactured from same material as valve operator, preventing access to valve operator, to accept lock shackle.

2.4 FABRICATION

A. End Connections:

1. Provide the type of end connections for valves as required in the Piping Schedules presented in Section 40 05 00 or as shown on the Drawings.

2. Comply with the following standards:

a. Threaded: ASME B1.20.1.

b. Flanged: ASME B16.1, Class 125 unless otherwise noted or AWWA C207.

c. Bell and spigot or mechanical (gland) type: AWWA/ANSI C111/A21.11.

d. Soldered: ASME B16.18.

e. Grooved: Rigid joints per Table 5 of AWWA C606.

B. Refer to individual valve Specification Sections for specifications of each type of valve used on Project.

C. Nuts, Bolts, and Washers:
1. Wetted or internal to be bronze or stainless steel.
a. Exposed to be zinc or cadmium plated.

D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.

E. Epoxy Interior Coating: Provide epoxy interior coating for all ferrous surfaces in accordance with AWWA C550.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Painting Requirements: Comply with Section 09 96 00 for High Performance Industrial Coatings.

C. Setting Buried Valves:
1. Locate valves installed in pipe trenches where buried pipe indicated on Drawings.
2. Set valves and valve boxes plumb.
3. Place valve boxes directly over valves with top of box being brought to surface of finished grade.
4. Install in closed position.
5. Place valve on firm footing in trench to prevent settling and excessive strain on connection to pipe.
6. After installation, backfill up to top of box for a minimum distance of 4 FT on each side of box.

D. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.

E. For grooved coupling valves, install rigid type couplings [or provide separate support to prevent rotation of valve from installed position].

F. Install electric or cylinder actuators above or horizontally adjacent to valve and gear box to optimize access to controls and external handwheel.

G. For threaded valves, provide union on one (1) side within 2 FT of valve to allow valve removal.

H. Install valves accessible for operation, inspection, and maintenance.

3.2 ADJUSTMENT

A. Adjust valves, actuators and appurtenant equipment to comply with Section 01 75 00.
   1. Operate valve, open and close at system pressures.

B. For all 120 VAC and 480 VAC electric actuators, employ and pay for services of valve actuator manufacturer's field service representative to:
   1. Inspect valve actuators covered by this Specification Section.
   2. Supervise adjustments and installation checks:
      a. Open and close valves electrically under local manual and demonstrate that all limit switches are properly adjusted and that switch contacts are functioning properly by verifying the inputs are received at the remote input/output (RIO) panels or local control panel as appropriate.
      b. Position modulating valves electrically under local manual control and demonstrate that the valve position feedback potentiometer is properly adjusted and that the feedback signal is received at the RIO panels or local control panel as appropriate.
      c. Simulate a valve position command signal at the RIO panel or local control panel as appropriate and demonstrate that the valve is controlled to the desired position without excessive hunting.

3. Provide Owner with a written statement that the valve actuator manufacturer has verified that the actuators have been installed properly, that all limit switches and position potentiometers have been properly adjusted and that the valve actuator responds correctly to the valve position command.

END OF SECTION