SECTION 40 05 57
VALVE AND GATE ACTUATORS

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall provide valve and gate actuators and appurtenances, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to valves and gates except where otherwise indicated in the Contract Documents.

C. Unit Responsibility: The valve or gate manufacturer shall be made responsible for coordination of design, assembly, testing, and installation of actuators on the valves and gates; however, the Contractor shall be responsible to the Owner for compliance of the valves, gates, and actuators with the Contract Documents.

D. Single Manufacturer: Where 2 or more valve or gate actuators of the same type or size are required, the actuators shall be produced by the same manufacturer.

E. Install equipment following applicable electrical standards.

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals including the following information: complete information on valve actuator including size, manufacturer, model number, motor, limit switches, electrical requirements, and mounting.

B. Shop Drawings: Shop Drawing information for actuators shall be submitted.

C. Calculations: Selection calculations showing dynamic seating and unseating torques versus output torque of actuator.

D. Technical Manuals: The Contractor shall furnish technical manuals for the butterfly valve manual actuators, and butterfly valve electric motor actuators.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless otherwise indicated, shut-off and throttling valves and externally actuated valves and gates shall be provided with manual or power actuators. The Contractor shall furnish actuators complete and operable with mounting hardware, motors, gears, controls, wiring, solenoids, handwheels, levers, chains, and extensions, as applicable. Actuators shall have the torque ratings equal to or greater than required for valve seating and dynamic torques,

whichever is greater, and shall be capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering. Actuator torque ratings for butterfly valves shall be determined in accordance with AWWA C504 - Rubber-Seated Butterfly Valves. Wires of motor-driven actuators shall be identified by unique numbers.

B. Manufacturers: Where indicated, certain valves and gates may be provided with actuators manufactured by the valve or gate manufacturer. Where actuators are furnished by different manufacturers, the Contractor shall coordinate selection to have the fewest number of manufacturers possible.

C. Materials: Actuators shall be current models of the best commercial quality materials and be liberally-sized for the required torque. Materials shall be suitable for the environment in which the valve or gate is to be installed.

D. Actuator Mounting and Position Indicators: Actuators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and be of ample strength. The word "open" shall be cast on each valve or actuator with an arrow indicating the direction to open in the counter-clockwise direction. Gear and power actuators shall be equipped with position indicators. Where possible, manual actuators shall be located between 48- and 60-inches above the floor or the permanent working platform.

E. Standard: Unless otherwise indicated and where applicable, actuators shall be in accordance with AWWA C 540 - Power-Actuating Devices for Valves and Slide Gates.

F. Functionality: Electric actuators shall be coordinated with the power requirements as indicated on the table of page 5.

G. Fasteners: Fasteners shall be stainless steel.

2.3 ELECTRIC MOTOR ACTUATORS

A. General

1. Equipment Requirements: Where electric motor actuators are indicated, an electric motor-actuated valve control unit shall be attached to the actuating mechanism housing by means of a flanged motor adapter piece.
2. Gearing: The motor actuator shall include the motor, reduction gearing, reversing starter, torque switches, and limit switches in a weather-proof NEMA 4 assembly. The actuator shall be a single or double reduction unit consisting of spur or helical gears and worm gearing. The spur or helical gears shall be of hardened alloy steel, and the worm gear shall be alloy bronze. Gearing shall be accurately cut with hobbing machines. Power gearing shall be grease- or oil-lubricated in a sealed housing. Ball or roller bearings shall be used throughout. Actuator output speed changes shall be mechanically possible by simply removing the motor and changing the exposed or helical gearset ratio without further disassembly of the actuator.
3. Starting Device: Except for modulating valves, the unit shall be so designed that a hammer blow is imparted to the stem nut when opening a closed valve or closing an open valve. The device should allow free movement at the stem nut before imparting the hammer blow. The actuator motor must attain full speed before stem load is encountered.
4. Switches
    a. Switches: Limit switches shall be furnished to sense valve position at each end of travel. Limit switch adjustment shall not be altered by manual operation. One set of normally open and one set of normally closed contacts will be furnished at each end of travel. Contacts shall be of silver and capable of reliably switching the source power from the control system as shown on the drawings. A torque sensor shall be furnished. The torque limit may be adjusted from 40 to 100 percent of rating in 1 percent increments. The motor shall be de-energized if the torque limit is exceeded. A boost function shall be included to prevent torque trip during initial valve unseating, and a "jammed valve" protection feature with automatic retry sequence shall be incorporated to de-energize the motor if no movement occurs. Valve actuators with limit switches shall be as manufactured by Limitorque or Rotork.
    b. The actuator shall be wired in accordance with the schematic diagram. Wiring for external connections shall be connected to marked terminals. Two conduit connections shall be provided in the enclosing case. A calibration tag shall be mounted near each switch correlating the dial setting to the unit output torque. Switches shall not be subject to breakage or slippages due to over-travel. Limit switches shall be of the heavy-duty open contact type with rotary wiping action.
5. Handwheel Operation: A permanently attached handwheel shall be provided for emergency manual operation. The handwheel shall not rotate during electrical operation. The maximum torque required on the handwheel under the most adverse conditions shall not exceed 60 lb.ft, and the maximum force required on the rim of the handwheel shall not exceed 60 lb. An arrow and either the word "open" or "close" shall be cast or permanently affixed on the handwheel to indicate the appropriate direction to turn the handwheel. A clutch lever shall be provided to put actuator into handwheel operation. Valves with electric motor actuators having stems more than 7-feet above the floor shall be provided with chain activator handwheels. The clutch

lever shall be provided with a cable secured to the chain to allow disengagement for manual operation.

6. Motor: The motor shall be of the totally enclosed, non-ventilated, high-starting torque, low-starting current type for full voltage starting. It shall be suitable for operation on 480 volt, 3-phase 60 Hz current (unless noted otherwise on the page 5) and have Class F insulation and a motor frame with dimensions in accordance with the latest revised NEMA MG Standards. The observed temperature rise by thermometer shall not exceed 55 degrees C above an ambient temperature of 40 degrees C when operating continuously for 15 minutes under full rated load. With a line voltage ranging between 10 percent above to 10 percent below the rated voltage, the motor shall develop full rated torque continuously for 15 minutes without causing the thermal contact protective devices imbedded in the motor windings to trip or the starter overloads to drop-out. Bearings shall be of the ball type, and thrust bearings shall be provided where necessary. Bearings shall be provided with suitable seals to confine the lubricant and prevent the entrance of dirt and dust. Motor conduit connections shall be watertight. Motor construction shall incorporate the use of stator and rotor as independent components from the valve operation such that the failure of either item shall not require actuator disassembly or gearing replacement. Two Class B thermal contacts or solid state thermistors imbedded within the motor windings shall be provided to protect against over-temperature damage. The motor shall be provided with a space heater suitable for operation on 120 volt, single phase, 60 Hz circuit unless the entire actuator is a hermetically sealed, non-breathing design with a separately sealed terminal compartment which prevents moisture intrusion. Each electric motor actuator shall be provided with a local disconnect switch or circuit breaker to isolate power from the motor and controller during maintenance activities.
7. Cycle time: Size open-close/throttling service valve motors for one complete OPEN-CLOSE-OPEN cycle no less than once every 10 minutes unless otherwise indicated elsewhere in the specifications.
8. Schedule for Electric AC Actuator Type: For a complete schedule of electric actuators required on project valves see the table on page 5.
9. All electric motor actuators shall be configured for Modbus TCP/IP communication protocol.

B. Electric Motor Actuators (AC Reversing (Open / Close) Control Type)

1. General: Where indicated, electric motor actuators shall be the AC reversing type complete with local control station with open / stop / close and local/off/remote selector switches on the actuator local control station.
2. Actuator Appurtenances: The actuator for each valve shall be provided with a padlockable disconnect switch, open and closed status lights, open, close and lockout stop pushbuttons, a local/off/remote selector switch, and other devices indicated. The disconnect switches in certain applications are required to be located remotely from the actuator body itself, as shown on the Contract Drawings. The local control station may also be provided as an integral part of the actuator or remotely as otherwise indicated or required to permit operation by a person at mezzanine elevation and within sight of the valve actuator. The Contractor shall provide conduit and wiring between the actuator controls and the valve actuator for these applications.

3. Starter: The starter shall be a suitably sized amperage rated reversing starter with its coils rated for operation on 480 volt, 3-phase, 60 Hz current (unless otherwise noted on the table on page 5). A control power transformer shall be included to provide a 120 volt source, unless otherwise indicated. The starter shall be equipped 3 overload relays of the automatic reset type. Its control circuit shall be wired as indicated. The integral weatherproof compartment shall contain a suitably sized 120 volt ac, single phase, 60 Hz space heater to prevent moisture condensation on electrical components. A local power disconnect switch shall be provided with each actuator. A close-coupled, padlockable switch shall be provided with each actuator.
4. Local Control Station: Each actuator shall be provided with a local control station with the valve actuator assembly. The station shall include open, close, and stop push buttons, and a local/remote selector switch.
5. Manufacturers:
   a. Rotork, IQ with worm gear, or IQT as appropriate for valve size.
   b. Auma, SIPOS with worm gear as appropriate for valve size.
   c. No "Or-Equals" allowed.

ACTUATOR TABLE

NUMBER	SIZE (inch)	VALVE TYPE	ACTUATOR TYPE	VOLTAGE	CLOSING TIME
JA-4-BV-1	42	BUTTERFLY	OPEN/CLOSE	208V, 3-PHASE	45 MINUTES (100 to 25% - 15 Minutes)
JA-4-BV-2	42	BUTTERFLY	OPEN/CLOSE	208V, 3-PHASE	45 MINUTES (100 to 25% - 15 Minutes)
JA-4-BV-3	42	BUTTERFLY	OPEN/CLOSE	208V, 3-PHASE	45 MINUTES (100 to 25% - 15 Minutes)
JA-1-BV-1	78	BUTTERFLY	OPEN/CLOSE	230V, 3-PHASE	45 MINUTES

NOTES
1. All valves are existing. Install new actuator and gear box.
2. Working pressure of JA-4-BV 1, 2, and 3 is 178 psi.
3. Working pressure of JA-1-BV-1 is 70 psi

Contractor will need to field verify manufacturer, model number, actuator mounting and input torque required.

PART 3 - EXECUTION

3.1 SERVICES OF MANUFACTURER

A. Field Adjustments: Field representatives of manufacturers of valves or gates with pneumatic, hydraulic, or electric actuators shall adjust actuator controls and limit-switches in the field for the required function.

3.2 INSTALLATION

A. Actuators shall be located to be readily accessible for operation and maintenance without obstructing walkways. Actuators shall not be mounted where shock or vibrations will impair their operation, nor shall the support systems be attached to handrails, process piping, or mechanical equipment.

B. Inspection, Startup, and Field Adjustment: An authorized representative of the manufacturer shall visit the Site and witness the following:
   1. Installation of the equipment.
   2. Inspection, checking, and adjusting the equipment.
   3. Startup and field-testing for proper operation.

C. Instruction of Owner's Personnel: The authorized service representative shall visit the Site to instruct the Owner's personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment.

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