FAYETTEVILLE PUBLIC WORKS COMMISSION

PROCUREMENT DEPARTMENT

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Bid Addendum

PWC Number:	PWC2526073
Bid Title:	Replace Clarifier #3 Mechanism at the Rockfish Creek WRF
Bid Opening Date and Time:	April 2, 2026
Addendum Number:	2
Addendum Date:	March 30, 2026
Procurement Advisor:	*Shelby Lesane* *procurement@faypwc.com*

1. Addenda acknowledgement is required within the IFB Bid Pricing Form.
2. Following are questions received about the solicitation and the SME's answers to the questions.

Q1. Section 40 05 57 (this is the actuator for the scum pipe) referenced in Specification Section 46 43 21.13-10., Part 2.07.G.

> 3. The rotating scum collecting pipe actuator shall be modulating and shall be equivalent to units as specified in Section 40 05 57, Valve Operators and Electric Valve Actuators. The rotating scum collecting pipe shall be operated by a 460V, 3 Phase, 60 Hertz motor. The drive shall be linked to the rotating trough by an adjustable arm. The system shall be mechanically adjustable while in service and shall be located in proximity to the walkway.

A1. Specification attachment addendum two.

Attachements:

Specification Section 40 05 57 – Valve Operators and Electric Valve Actuators

SECTION 40 05 57
VALVE OPERATORS AND ELECTRIC VALVE ACTUATORS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Equipment shall be provided in accordance with the requirements of Section 46 00 00 – Equipment General Provisions and Section 40 05 00 – Basic Mechanical Requirements.

B. Reference Section 40 06 20 – Process Pipe, Valve, and Gate Schedules for additional information on valves and operators/actuators.

C. The electric valve actuators shall meet the signal requirements described in Section 40 61 23 – Signal Coordination, Section 40 61 93 – Process Control System Input/Output List, and Section 40 61 96 – Process Control Descriptions.

D. Valve operators and electric valve actuators shall be designed to unseat, open or close, and seat the valve under the most adverse operating condition to which the valves will be subjected.

E. Operator mounting arrangements shall be as indicated on the Drawings or as directed by the manufacturer and/or Engineer. There shall be no mounting restrictions on the electric valve actuator.

F. The valve operators and electric actuators shall be the full and undivided responsibility of the valve manufacturer in order to ensure complete coordination of the components and to provide unit responsibility.

1.02 SUBMITTALS

A. The following items shall be submitted in accordance with, or in addition to the submittal requirements specified in Section 01 33 00 – Submittal Procedures and Section 46 00 00 – Equipment General Provisions:

1. Shop Drawings

2. O&M Manuals

3. Certification that the force required to operate all valves is as specified herein.

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PART 2 – PRODUCTS

2.01 GENERAL

A. Electric actuators shall be provided where specified in the Valve Schedule in Section 40 06 20 – Process Pipe, Valve, and Gate Schedules.

B. Manual operators shall be provided on all valves which do not receive electric actuators. Manual operator type shall be as specified herein and as shown on the Drawings.

C. Quarter turn valves 8" and greater in size shall have geared operators. Gate valves 14" and greater in size shall have geared operators.

D. Operators/actuators shall be furnished with conservatively sized extension bonnets, extension stems, or torque tubes, and all required appurtenances required for a complete installation. Operators furnished with extension bonnets shall include stainless steel extension stems, or stainless steel torque tubes.

2.02 MANUAL OPERATORS

A. Unless otherwise specified or shown on the Drawings, manual operator type shall be as follows:

1. Buried valves shall be equipped with nut operators, extended stems, and valve boxes. Where the depth of the operating nut is more than 4 feet below finish grade, a valve operator extension shall be provided to bring the operating nut to within 18-24 inches of the surface.

2. Exposed valves up to 6-inch shall be lever operated (except gate valves).

3. Exposed valves 8-inches and larger shall be handwheel operated.

4. Exposed gate valves shall be handwheel operated.

5. Valves with centerline of operator located more than 6-feet above the floor or platform from which it is to be operated shall have a chainwheel operator unless otherwise indicated on the Drawings.

B. Manual operators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.

C. All operators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.

D. Valve operators shall be designed so that the force required to operate the handwheel, lever, or chain (including breakaway torque requirements) does not exceed 80 pounds

applied at the extremity of handwheel or chainwheel operator. Design pressures for sizing of valve operators shall be the piping test pressure for the piping in which the valve is to be installed as shown in the Piping Schedule in Section 40 06 20 – Process Pipe, Valve, and Gate Schedules.

E. Handwheels for valves operators shall not be less than 12 inches in diameter. The maximum diameter of any handwheel shall not exceed 24".

F. Nut operators shall have standard 2-inch square AWWA operating nuts designed in accordance with AWWA C504-94.

G. Geared manual operators shall be of the worm gear, traveling nut or scotch yolk type except manual operators for butterfly valves 18-inch in diameter or larger which shall be worm gear, unless otherwise indicated in the individual valve specification. Gear operators shall be of the worm gear or bevel gear type. Gear box designs incorporating end of travel stops in the housing shall be equipped with AWWA input stops. Each gearbox shall require a minimum of 10 turns for 90 degree rotation or full valve stem travel and shall be equipped with a mechanical valve position indicator.

H. Manual operators on below grade (and vault installed) valves shall be permanently lubricated and watertight under an external water pressure of 10 psi.

2.03 ELECTRIC VALVE ACTUATORS FOR PROCESS AIR CONTROL (120V)

A. Modulating service valve actuators shall be Group 11 rotary valve drives as manufactured by Harold Beck and Sons, Inc. Operators shall be furnished with 120-volt, single phase, 60 Hz AC, TENV, permanent magnet, synchronous, inductor motors with Class H insulation, and specifically designed for modulating service as specified in the Valve Schedule in Section 40 06 20. Motor shall be non-coasting, suitable for high duty cycle conditions, and shall be self-locking and self-releasing without the use of a separate brake winding, mechanical brake, or worm gear mechanism. The motor shall be capable of up to 60 starts/stops per minute or a temporary stall condition without overheating. Triacs shall be utilized for solid-state switching. Torque capacity of the operators shall be sufficient to operate the valves with a maximum pressure differential indicated in the Valve Schedule in Section 40 06 20 with a safety factor of at least 1.5. Maximum current draw of motors shall be 3.1 amperes in a fully stalled condition. Motors shall reach synchronous speed on start-up in 1.5 AC power cycles and shall also reach dead stop from full synchronous speed in 1.5 cycles. Motor shall not overheat or fail when in continuous stall condition for 72 hours. No electrical or thermal overload protection shall be required for protection of a stalled or cycling operator.

B. Control drive shall be designed to stay in place upon loss of power and shall be capable of holding a load equal to at least 200% of the model's rated output. Stall torque shall be self-limiting not exceeding 2.5 times the rated torque. Torque switches shall not be required. Drive shall operate on an increasing signal for full 100° rotation. Control drives shall be able to operate in any mounting orientation.

C. Gear train shall have high efficiency spur gears constructed of heat-treated alloy steel or ductile iron only. Readily available gear modules shall provide for a range of torque and timing combinations within the drive's rated capacity, and shall be field-interchangeable. Gears shall be rated at twice the output torque of the operator, so that a continuous stall condition of 72 hours will not create any significant wear or performance degradation. To protect against accumulative stall damage in Auto mode, the drive should automatically discontinue motor operation when the motor current is detected to be flowing in the same direction for 300 seconds. Over-travel of operator shall be prevented by internal mechanical stops cast into the operator. Operating time between full limits of travel shall be no less than 60 seconds.

D. Motor pinion and all gearing shall be lubricated with a premium, heavy-duty lithium-based lubricant, and shall not require changing of the lubrication for a minimum of five years. No oil baths shall be used for lubrication purposes. Maintenance-free bearings shall be used.

E. A low-speed, disc-type motor, solid cast handwheel shall be provided, directly connected to the motor's rotor, for manual operation. A mechanical indicator of valve position shall be provided and attached to the main output shaft driving the load. No declutching mechanism shall be required for manual operation.

F. Linkage between operator and valve shall be by crank arms and connecting rod, with adjustable starting point of valve position and adjustable rod length. Operators shall stop precisely within 0.15 degrees of the desired control position. Operator output shaft shall be stainless steel. Stem shall be self-locking when the motor is de-energized. Modular construction and special lubrication shall permit the operator to be mounted in any position. Modulating operators shall be capable of operating in ambient temperatures ranging from -40°F to 185°F.

G. Operators shall be provided with four individual compartments for the motor, gearing, wiring terminals, and auxiliary switches plus position sensing device. Compartments shall be provided with moisture and dust-proof rigid cast covers. All switches, wiring, relays, etc., shall be brought to a gasketed and sealed terminal board for field connection. Two conduit entries shall be provided with the actuator, one 1/2-inch NPT for signal wiring and one 1-inch NPT for power wiring. Conduit shall be run properly to avoid water ingress to the compartments. The motor shall have electrical connections soldered directly to the wiring terminal block where appropriate. Double cartridge shaft seals shall be provided on the handwheel and output shafts for weatherproof protection.

H. Two SPDT limit switches for over-travel protection and four auxiliary SPDT limit switches (two normally open, two normally closed) shall be provided on all operators. Limit switches shall be snap-acting, SPDT, silver alloy contacts rated for 6 amperes at 120 VAC. Switches shall have lubrication-free nylon rollers, polished stainless steel roller-axle, and tempered blades. Switches shall be infinitely adjustable over the full range of valve travel. Limit switches shall be wired to a terminal board for remote output.

Drive shall also have integral mechanical stops, capable of limiting travel of the drive and load, with or without the drive motor.

I. Modulating actuators shall have a position feedback potentiometer mounted directly to the valve actuator gearing inside the gearing compartment. The potentiometer shall provide a 4-20 mA signal corresponding to valve position. Modulating valve actuators shall be designed to respond to either a 4-20mADC analog signal or a digital pulse signal as specified herein or as required to coordinate with the requirements of Division 40. Reference Specification Section 40 06 20 – Valve Schedules.

1. Modulating valve actuators designed to respond to a 4-20mADC signal shall be provided with a valve positioner which shall position the valve proportional to an externally generated 4-20mADC signal. The valve positioning control circuitry shall position the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer. The positioner shall be field adjustable to fail to the "open," "closed," or "last" position on loss of 4-20 mADC command signal.

2. Modulating valve actuators designed to respond to "pulse" open/close signals shall operate the valve during the time the open or close pulse signal is high. Modulating actuators designed to respond to "pulse" open/close signals shall have the latching circuitry described above for open/close actuators disabled.

J. Actuators shall contain wiring and terminals for the following control functions. All dry contacts shall be rated for 6A at 120VAC.

1. A five-position, drive-mounted electric handswitch shall be provided to permit local electrical operation of the unit for control adjustment or operation on loss of control signal.

2. Four (4) unpowered contacts shall be provided, three of which shall be selected to indicate valve "Opened" position, valve "Closed" position, and "Auto" status of the actuator. "Fail" status of the actuator shall be monitored from a separate terminal. In normal operation, this terminal shall not be energized. The "Fail" contact shall activate upon a stall condition, motor overtemperature, or loss of signal event.

3. Where required in the Valve Schedule in Section 40 06 20 – Valve Schedules, the actuator must be wired to interface with the remote manual control station as supplied by the Electrical Contractor.

K. Certified electrical control schematic diagrams shall be provided by the actuator Manufacturer for each service type of electric actuator. Interconnecting wiring information shall be submitted including terminal numbers, color coding, and the name and terminal numbers, for items to which the wiring is to be connected.

L. Enclosure shall be totally enclosed, cast, weatherproof, dust-tight, NEMA 4X, construction and IP68 rated. Separate conduit entrances shall be available for power

and control wiring connections. Actuators located in hazardous areas shall be suitable for the Class, Division, and Group rating of the location.

M. Local Controls

1. A five-position, drive-mounted electric handswitch shall be provided to permit local electrical operation of the unit for control adjustment or operation on loss of control signal. All switches, wiring, relays, etc. shall be brought to a terminal board for field connection.

   a. When the handswitch is in the “Auto” position, the actuator shall be controlled by remote control signals. Operators for modulating service shall be provided with integral position controllers which shall receive a pulse signal and, while in "Auto" mode, shall position the valve.

   b. When the handswitch is in the “CW” or “CCW” position, the actuator shall move toward the appropriate end-of-travel limit switch. Placing the selector switch in the “Stop” position shall stop the actuator travel.

2.04 ELECTRIC VALVE ACTUATORS (480V)

A. Electric Actuators shall be open/close service or modulating service as specified in the Valve Schedule in Section 40 06 20 – Process Pipe, Valve, and Gate Schedules.

1. Open/Close (non-modulating) valve actuators shall be IQ series as manufactured by Rotork, SA series as manufactured by AUMA, or Series 2000 as manufactured by EIM Controls.

2. Modulating valve actuators shall be Type IQM as manufactured by Rotork, Type SAR as manufactured by AUMA, or Series 2000 Futronic as manufactured by EIM Controls.

B. Performance Requirements

1. The actuators shall be designed for indoor and outdoor service and shall be capable of mounting in any position.

2. Torque capacity of the actuators shall be sufficient to operate the valves with the maximum pressure differential, as indicated in the Valve Schedule in Section 40 06 20 – Process Pipe, Valve, and Gate Schedules, with a safety factor of 1.5. Actuators in modulating service will be selected such that the required dynamic valve torque is no more than 60% of the electric actuator’s maximum rated breakaway of torque.

3. Operating time for full limits of travel shall be not more than 2 seconds per inch diameter of the valve, +/- 50 percent through 20 inches; +/- 30 percent for valves

24 inches and larger. Operating time shall not be less than 60 seconds for all modulating valves.

4. Actuators shall be capable of operating in ambient temperatures ranging from 0 degrees F – 160 degrees F.

5. For open/close (non-modulating) actuators, the gearing, motor and contactor shall be capable of 60 starts per hour without overheating.

6. For modulating actuators, the gearing, motor and contactor shall be capable of 1200 starts per hour without overheating.

C. The actuators shall include, in one integral housing, individual compartments for the motor, gearing, wiring terminals, and control circuits. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal. The inner seal shall protect the motor and all other internal electrical elements of the actuator from entrance of moisture and dust when the terminal cover is removed. Double cartridge shaft seals shall be provided on the hand wheel and output shafts for weatherproof protection. All external fasteners shall be stainless steel. Compartments shall be provided with moisture and dust-proof rigid cast covers meeting NEMA 6, certified to submergence in 6 ft of water for 30 minutes. Actuators located in hazardous areas shall be suitable for the Class, Division, and Group rating of the location.

D. All gearing shall be hardened alloy steel or bronze and shall be rated at twice the output torque of the operator and shall be designed to withstand the stall torque of the motor without failure. Output drive gearing shall consist of a worm shaft and worm gear pinion operating in an oil bath. The worm gear pinion shall be alloy bronze. Worm gear drive shall be self-locking to prevent creeping of the valve disc in an intermediate position. Heavy-duty grease shall protect gearing and sealed ball bearings of the main shaft for five years without changing. Motor reduction gearing shall be spur or planetary gearing and shall allow for field repair and change in gear ratio. For quarter turn applications, overtravel of the operator shall be prevented by internal mechanical stops cast into the actuator.

E. A mechanical dial position indicator shall be furnished to continuously indicate the position of the valve at and between the fully open and fully closed positions. The indicator shall be driven by gearing driven off of the main worm gear pinion and shall operate when the actuator is in either the electrical mode or manual mode.

F. A handwheel shall be permanently attached for manual operation. A gear assembly shall be provided between the handwheel and the worm shaft if required to reduce the force necessary to operate the handwheel to less than 40 pounds. A positive declutch mechanism shall engage the handwheel when required. When the actuator is set in the declutched position for handwheel operation, it shall return automatically to electric operation when actuator motor is energized. The handwheel shall not rotate during electric operation nor shall a fused motor prevent handwheel operation.

G. The drive motor shall be specifically designed for actuator service and shall be characterized by high starting torque and low inertia. Motors shall be 460 volts, three phase, 60 Hz AC reversible squirrel cage induction type motors and shall be specifically designed for modulating service where indicated on the Valve Schedule in Section 40 06 20 – Process Pipe, Valve, and Gate Schedules. Motors shall be totally enclosed, non-ventilated, with NEMA Class F insulation minimum (Class H for modulating actuators) and a maximum continuous temperature rating of 120 degree C (rise plus ambient). A 120 VAC space heater shall be provided in the motor compartment. The electric motor shall have a time rating of at least 15 minutes at 104°F (40°C) or twice the valve stroking time, whichever is longer, at an average load of at least 33% of maximum valve torque. Motor bearings shall be permanently lubricated by premium lubricant. The motor shall have plug and socket electrical connection to facilitate easy removal and replacement. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator. The motor shall include single phase protection. A suitable thermal protection device shall be incorporated in the motor or motor starter circuits, connected to a tripping device. Fast acting fuses shall be provided to protect solid state components. The motor shall be capable of starting against the rated load in either the open or close direction when voltage to the motor terminals is plus or minus ten (10) percent of nameplate rating.

1. Open/Close actuators shall be furnished with electro-mechanical reversing starters.

2. Modulating actuators shall be furnished with solid state reversing starters utilizing thyristors.

H. Leads from the motor shall be brought to the control circuit (limit switch) compartment without external piping or conduit box. An adequately sized space heater shall be installed in the control circuit compartment to aid in the prevention of damage resulting from condensation. The following items shall be located in the control circuit compartment.

1. Torque limit switches shall be provided to de-energize the motor control circuit in the event of a stall when attempting to unseat a jammed valve and when torque is exceeded during valve travel. Each actuator shall have an open direction torque switch and a close direction torque switch. The torque switches shall be mechanically operated and able to be set in torque units. Torque switches shall be calibrated prior to the actuator's assembly to the valve.

2. Travel limit switches shall be provided to de-energize the motor control circuit when the actuator reaches the limits of travel in the open and close directions. The limit switch drive shall be of the counter gear type and "in step'" with the actuator output drive at all times in either the electrical or manual mode of operation. A minimum of six (6) contacts, three (3) normally open and three (3) normally closed, shall be supplied at each end of valve travel. Four (4) additional

contacts shall be provided to report end of travel or any desired position between ends of travel.

I. Modulating actuators shall have a position feedback potentiometer mounted directly to the valve actuator gearing inside the gearing compartment. The potentiometer shall provide a 4-20 mA signal corresponding to valve position. Modulating valve actuators shall be designed to respond to either a 4-20mADC analog signal or a digital pulse signal as specified herein or as required to coordinate with the requirements of Division 40. Reference Specification Section 40 06 20 – Valve Schedules.

1. Modulating valve actuators designed to respond to a 4-20mADC signal shall be provided with a valve positioner which shall position the valve proportional to an externally generated 4-20mADC signal. The valve positioning control circuitry shall position the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer. The positioner shall be field adjustable to fail to the "open," "closed," or "last" position on loss of 4-20 mADC command signal.

2. Modulating valve actuators designed to respond to "pulse" open/close signals shall operate the valve during the time the open or close pulse signal is high. Modulating actuators designed to respond to "pulse" open/close signals shall have the latching circuitry described above for open/close actuators disabled.

J. The electrical terminals shall be housed in a double sealed terminal compartment isolated from the rest of the actuator components. The actuators shall be designed to operate from a single 480VAC, 3-phase source. The actuators shall be furnished with fuses inside of the terminal compartment. A quantity of two – ¾ inch NPT conduit entries shall be furnished.

K. Actuators shall contain wiring and terminals for the following control functions. All dry contacts shall be rated for 5A at 250VAC.

1. Open, Close, and Stop commands from external dry contacts (utilizing internal 24VDC power supply) and/or from an external signal of 12V to 120V. The inputs for the open, close, stop signals shall be field selectable to be respond to either maintained or momentary remote signals. In momentary mode, the actuator shall have internal latching circuitry that causes the operator to drive the valve to its limit of travel upon receipt of the momentary contact signal unless a stop signal is received.

2. Emergency override input from a normally closed or normally open contact. The actuator shall either open or close (field selectable) upon receiving the emergency override input.

3. Remote Local-Off-Remote selector switch, Open/Close pushbuttons, and Open/Closed pilot lights for a remote manual control station (see below). The remote Local-Off-Remote selector switch and Open/Close pushbuttons shall be a

dry contact input to the actuator control circuitry. The Open/Closed pilot lights shall be powered from the valve actuator control power.

4. Four (4) unpowered contacts shall be provided which can be selected to indicate valve "Opened" and "Closed" position, "Remote" status of the actuator, and fail status of the actuator. The fail status contacts shall activate upon motor overtemperature and actuator overtorque as a minimum.

5. Terminals for 4-20mADC position command and 4-20mADC position feedback as described above for modulating actuators.

L. Local Controls

1. Actuators shall be furnished with a Local-Off-Remote selector switch; Open, Close, and Stop pushbuttons for local control; a red lamp indicating closed and a green lamp indicating open. L-O-R switch shall be padlockable in any of the three positions.

   a. When the LOR is in the "Local" position, open/close control shall be by the open and close pushbuttons on the actuator. The stop push button shall stop the actuator travel.

   b. When the LOR is in the "Off" position, the actuator shall not operate.

   c. When the LOR is in the "Remote" position, the actuator shall be controlled by remote inputs from the PLC or from the remote manual controls station.

2. The local controls shall be arranged so that the direction of travel can be reversed without the necessity of stopping the actuator.

M. Remote Manual Control Station

1. Where indicated in the Valve Schedule in Section 40 06 20 – Process Pipe, Valve, and Gate Schedules, manual actuator controls shall be furnished in a separate NEMA 4X stainless steel enclosure (NEMA 7 if located in a classified area). Manual control station controls shall include Hand–Off-Auto Selector switch; Open, Stop, and Close pushbuttons; a red lamp indicating closed and a green lamp indicating open.

   a. When the HOA is in the "Hand" position, open/close control shall be by the open and close pushbuttons on the remote manual control station. The stop push button shall stop actuator travel.

   b. When the HOA is in the "Off" position, the actuator shall not operate.

   c. When the HOA is in the "Auto" position, the actuator shall be controlled by remote inputs to the valve actuator from the PLC.

2.05 ELECTRIC OPERATORS FOR PVC/CPVC VALVES

A. Automatic electric operators shall be provided for PVC/CPVC valves where specified and/or as shown on the Drawings. Operator main power shall be 120VAC, single phase, 60 hertz. Motors shall be quarter-turn, with epicyclic transmission, capacitor-run, reversing type, and shall be specifically designed for modulating or open/close service. Modulating units to provide feedback signal. The Operator shall be provided with an anti-condensate heater. Motors shall be provided with integral thermal overload protection with auto-reset. Operator gears and shafts shall be constructed of heat treated high-alloy steel. Operator gear trains shall be permanently lubricated. Units shall include manual override handwheel. Operator enclosures shall be rated NEMA 4/4X. Externally, the Operator shall be electrostatically powder-coated for corrosion resistance and include a raised visual position-indicator with high-contrast red/green colors. Local control stations to have 3-position maintained rotary switches with LED indicators showing open/close, remote, local, and fault status.

B. Provide two (2) volt-free Form A auxiliary switches (dry contacts) with independently adjustable cam for valve position indication. Limit switches shall be rated for 10 amps at 250VAC. Actuator remote status and fault status shall also be provided. The Contractor shall coordinate operator controls with the functional requirements specified in Section 40 61 96, Process Control Descriptions.

C. Actuators shall be HRCL Series by Hayward Flow Control or approved equal.

PART 3 – EXECUTION

3.01 MANUFACTURER'S FIELD SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 46 00 00 – Equipment General Provisions and shall include the following site visits for electric actuators:

Service	Number of Trips	Number of Days/Trip
Installation and Testing	1	1
Startup and Training	1	1
Services after Startup	1	1

3.02 INSTALLATION

A. All valve actuators shall be installed in accordance with the manufacturer's published recommendations and the applicable Specification Sections for valves and motor controls.

B. Valve actuators shall be factory coated in accordance with the manufacturer's standard paint system.

3.03 SHOP TESTING

A. Shop testing shall be in accordance with Section 46 00 00 – Equipment General Provisions and with the following additional requirements:

1. Conduct a complete functional check of each unit. Correct any deficiencies found in shop testing prior to shipment.

2. Submit written certification that:

a. Shop tests for the electrical system and all controls were successfully conducted;

b. Electrical system and all controls provide the functions specified and required for proper operation of the valve operator system.

3. Each actuator shall be performance tested and individual test certificates shall be supplied free of charge. The test equipment shall simulate each typical valve load and the following parameters should be recorded:

a. Current at maximum torque setting

b. Torque at maximum torque setting

c. Flash Test Voltage

d. Actuator Output Speed or Operating Time

e. In addition, the test certificate should record details of specification, such as gear ratios for both manual and automatic drive, closing direction, and wiring diagram code number.

f. Verification of actuator torque rating with valve.

3.04 FIELD TESTS

A. Field testing shall be in accordance with Section 46 00 00 – Equipment General Provisions and with the following additional requirements:

1. Valve actuators shall be field-tested together with the associated valves.

2. Test all valves at the operating pressures at which the particular line will be used.

3. Test all valves for control operation as directed.

4. Field testing shall include optimization of opening and closing times of the valves. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

B. Preliminary Field Tests

1. General: Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components.

2. Scope: Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly.

3. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation, as specified or otherwise directed.

C. Final Field Tests

1. Final field tests shall be conducted in accordance with the latest revision of AWWA C500.

2. Final field tests shall be conducted simultaneously with the start-up and field testing of the pumps.

3. Final field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing.

4. Certification of Equipment Compliance: After the final field tests are completed and passed, submit affidavit according to Section 46 00 00 – Equipment and General Provisions.

END OF SECTION