

SECTION _____ PNEUMATIC ROTARY VANE ACTUATORS

PART 1: GENERAL

1.1 WORK INCLUDED

- A. Furnish, install, startup, and test pneumatic rotary vane AWWA C541-21 compliant valve actuators and associated valves with required accessories as shown on the Plans and as specified herein. A single supplier shall provide the vane type pneumatic valve actuators and valves as one complete system. The valves shall be in accordance with Section _____.
- B. The contractor shall furnish and install the required air tubing with fittings, connections, taps, pressure switches, electrical devices, wiring, and terminations necessary for a complete system and shall also install the valves with valve actuators. Each actuator shall have an isolation safety exhaust valve with locking handle provided at each branch airline to the actuator. Air tubing shall be furnished and installed from the compressor to the actuators. Air tubing and fittings shall be stainless steel and sized as shown on the Plans. Slope air headers to low points and provide moisture traps with drip legs at the low points. Branch connections off main line shall be made off the top of the main line. Furnish taps, isolation valves, and pressure switches on the air piping as shown on the Plans.
- C. The contractor shall coordinate between the pneumatic valve actuator/control valve supplier and the control system supplier to provide complete and fully operational system. It will be the valve/actuator supplier's responsibility to provide actuators that are capable of sending and accepting the necessary signals from the control system. The valve/actuator supplier shall provide any limit switches, positioners, or other devices necessary to enable the status of the valves (open/close or position for modulating valves) to be monitored and controlled by the control system.

1.2 QUALITY ASSURANCE

- A. All equipment of each type specified in this section shall be supplied by a single supplier.
- B. The equipment supplier shall furnish a qualified field representative for a minimum of _____ working days total on _____ separate occasions to provide guidance with installation, inspect all equipment described herein after installation, to assist in troubleshooting, to advise the owner during startup and testing, and to train Owner's personnel in routine maintenance and troubleshooting procedures. This time period shall consist of a minimum of 8-hour days, and travel to and from the project site shall not be included. Contractor shall coordinate the scheduling of such training and startup assistance with Owner's personnel. Travel to and from the project site shall be the responsibility of and at the cost of the equipment supplier. Owner may videotape training session.
- C. Supplier's installation report is required prior to final acceptance.
- D. Supplier shall maintain a complete stock of spare parts commonly needed for the equipment specified at a location or shall furnish spare parts within 48 hours of request.
- E. All automated valve assemblies shall have an engraved Type 316 stainless steel manufacturer's nameplate securely affixed in a conspicuous place on the equipment showing

the ratings, serial number, model number, manufacturer, and other pertinent nameplate data.

1.3 SUBMITTALS

- A. Submittals shall be prepared and submitted in accordance with Section _____.
- B. The following submittals are required at a minimum in addition to the applicable requirements of Section _____.
 - 1. Shop drawings and applicable product data specific to this project shall be supplied in electronic format or bound neatly in a single package per engineer's requirements. The following information shall be included as a minimum:
 - a. Part numbers of all equipment within this specification and a schedule showing all actuators and valves furnished for this project.
 - b. Design performance characteristics, capacities, sizes, ratings, and other appropriate information.
 - c. Layout drawings including all proposed system components with dimensions, clearances required, and sizes indicated, and arrangement and size of connections.
 - d. Listing of materials of construction for all components.
 - e. Complete information on all electric and instrumentation equipment and electric power requirements.
 - f. Complete wiring diagrams and data on controls to be furnished.
 - g. Manufacturer's instructions regarding delivery, storage, and handling of equipment.
 - h. Adjustable settings for valve opening, closing, and emergency closing speeds.
 - 2. Location of nearest stocking distributor of spare parts.
 - 3. Complete operation and maintenance data for all major equipment and ancillary items in accordance with specifications.
 - 4. Startup and test schedule.
 - 5. Equipment installation report with field test data and test records.
 - 6. Warranties and service agreements.
- C. All deviations from contract documents shall be clearly identified and submitted to the engineer through the contractor as a contract modification request.
- D. Any other information necessary for engineer to determine compliance with the specifications.
- E. Engineer will not review partial or incomplete submittals.

1.4 EXPERIENCE REQUIREMENTS

- A. All equipment shall be furnished by a supplier or manufacturer having at least twenty (20) U.S. installations of the type being proposed, including coordination and assembly responsibility for the valve, actuator, and associated devices for a complete package, each with a minimum of 30 years of satisfactory service.
- B. A list of similar installations shall be furnished with the shop drawing submittal, including names and telephone numbers of contacts, when required in the purchase documents.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage, and handling shall be in full accordance with manufacturer's instructions.

1.6 WARRANTY

- A. All actuator assemblies shall be warranted for a minimum period of one year or two million operations from the date of shipment. A certificate listing actuator serial numbers shall be provided prior to shipment to validate the warranty. Valve carries valve manufacturer's standard warranty.

PART 2: PRODUCTS

2.1 PNEUMATIC ROTARY VANE VALVE ACTUATOR DESIGN

- A. The actuator is essentially an integral part of the valve assembly.
- B. Actuator Design: Pneumatic actuators are to be of the vane type design with only one (1) moving part. Pneumatic vane actuators shall meet AWWA C541 (latest revision) standards.
- C. All actuators must have a unique serial number for identification and traceability.
- D. Actuator Materials of Construction:
 - 1. Housing: Actuator housing shall be either diecast zinc alloy, aluminum alloy or sand-cast aluminum alloy. Actuator housing must be externally coated with corrosion resistant baked epoxy enamel, Synthetic Thermoplastic Polyamide (STP) or Kinetrol Blueline food grade coating as specified by the engineer. Actuator housing internal surfaces shall be coated with corrosion resistant baked epoxy enamel, Synthetic Thermoplastic Polyamide (STP) or Teflon polymer. The housing shall be reinforced with a cast transverse rib above and below each outboard housing fastener to prevent distortion under full supply pressure, and as a proof of design shall have been hydrostatically tested with water to 4 times the maximum recommended working pressure.
 - 2. Vane / Output Shaft: Actuator one piece shaft and vane shall be either bare stainless steel or SG (ductile) iron with zinc plating or anodized.
 - 3. Vane Seals: Vane seals shall be double opposed lip seals made of wear resistant polyurethane and must be preloaded with stainless steel spring expanders. The vane seal design must protect the shaft seals from the air supply and be rated for temperatures ranging from -40 to 176 degrees Fahrenheit. Other types of vane seals are not

acceptable.

4. Shaft Seals: Shaft seals and shaft bushings shall be replaceable. Shaft seals shall be captured by the actuator housing to prevent seal blowout under pressure.
5. Side Plates: The vane seal retainers (side plates) shall be energy absorbing reinforced polyamide designed to prevent shock loading of the actuator at the travel stops and must be enlarged to minimize air consumption by filling the internal cavity of the actuator. This important design dramatically reduces air consumption thereby maximizing efficiency and reducing operating costs. Epoxy coated metal side plates are only acceptable for actuators that produce more than 5000 lbf-ft of torque and must include provisions to prevent metal to metal shock loading at the actuator travel stop, vane and shaft assembly.
6. Travel stops: All fasteners shall be stainless steel. Travel stops shall be stainless steel and shall be capable of allowing stroke adjustments from 80 to 100 degrees, unless specified otherwise in the engineering or purchasing documents. Travel stops shall allow independent adjustment at each end of travel.
7. Testing: All die casting and machining of actuator housing and vane, and all injection molding of vane seals, must be performed in house by the actuator manufacturer to ISO 9001-2008 standards to assure the highest quality equipment is produced. Failure to provide proof of ISO certification of the factory and AWWA certification shall be reason for rejection.

E. Actuator Position Control Capability:

1. Open/Close Valves: Actuators shall be solenoid valve operated. Solenoid valves for smaller actuators shall have a NAMUR interface for direct mounting, with the option to provide body ported solenoid valves to meet remote mounting or other special application requirements. Solenoid coils shall be 120 V AC / 60 Hz, or 24 V DC and NEMA Type 4 rated. Speed control devices shall allow independent adjustment of OPEN and CLOSE cycling speed. Each solenoid valve to include manual override to hold valve in either the OPEN or CLOSE position in the event of a power outage. Exhaust air mufflers shall be standard. Provide 80 to 100 PSI clean, dry air to solenoid valve.

Each Open/Close actuator shall include valve position feedback limit switches for remote OPEN and CLOSE indication. Two SPDT switches shall be housed in a NEMA Type 4X aluminum enclosure with a Clear Cone Monitor visual valve position indicator that can be seen from above and from the side. The Clear Cone Monitor shall use the colors green for open and red for close. Two mechanical micro switches shall be included and shall be rated for AC or DC service. Limit switch cams shall be infinitely adjustable. The position feedback unit shall be a Kinetrol VLS or XLS Switch Box manufactured by Kinetrol.

2. Modulating Valves: The actuator shall be designed to control the valve in all positions from fully open to fully closed, and from fully closed to fully open with control in any intermediate position corresponding to the variable control system input. Positioner shall consume a maximum of .02 SCFM while in the resting state. Positioners consuming greater than .02 SCFM will not be acceptable. The positioner shall receive a 4-20 mA input control signal from the control system for precise positioning control of the valve. Where specified in the Valve Actuator Schedule, provide a 4-20mA position transmitter,

and/or two mechanical limit switches, mounted inside or directly to the positioner housing. Positioner construction shall be of aluminum or zinc alloy with a corrosion resistant finish, have a NEMA Type 4 or 4X rating and be suitable for -4 to +160 degrees Fahrenheit. Fasteners to be stainless steel. Provide 80-100 psi clean dry supply air to the positioner. Positioner shall be manufactured and supplied by the actuator manufacturer and shall be intended for use with the actuator provided for modulating application. The positioner shall be a Kinetrol AP, EL or P3 Positioner manufactured by Kinetrol.

3. Mechanical Manual Override: Where specified in the Valve Actuator Schedule, actuator shall include a handwheel operated declutchable geared override to be mounted between the actuator and the valve. The manual override shall be able to move and hold the valve in any position between fully open and fully closed. The manual override shall be capable of remaining on the valve and fully operational with the actuator removed and include two mechanical valve position stops. The manual override shall have a metal housing rated for NEMA Type 4 or 4X.
 4. Accessories such as limit switches, positioners, solenoid valves, speed controls, piping and tubing that are provided by the actuator manufacturer and as required by the specification shall be fitted and tested by the actuator manufacturer prior to shipment to the jobsite.
- F. Torque Capability: The rated torque capability of each actuator shall be sufficient to seat, unseat, and rigidly hold, in any intermediate position, the valve disc it controls under the operating conditions specified herein. Torque safety factors shall conform to AWWA Standards and in no case be less than 1.25 times the valve manufactures specified torques based on operating conditions for open/closed applications and 1.5 times the valve manufacturers specified torques based on operating conditions for modulating applications.
- G. Safety Factor: Actuator housings, supports, and connections to the valve shall be designed with a minimum safety factor of 5, based on the ultimate strength, or a minimum safety factor of 3, based on the yield strength of materials used.
- H. Stop-Limiting Devices: Valve actuators shall be equipped with adjustable mechanical stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Position stops shall provide, at minimum, 80 to 100 degrees of adjustable travel.
- I. Pneumatic actuator working pressures between 80 and 100 PSIG are recommended for optimal actuator performance and longevity. The pneumatic actuators shall have an overload pressure of up to 150 PSIG, and as a proof of design shall have been hydrostatically tested with water to 4 times the maximum recommended working pressure.
- J. Actuators shall be equipped with adjustable flow-control devices controlling the operating air exhausting from the actuator. The devices shall be located at or near the actuator or on the solenoid valve. The opening and closing speeds shall be nominally set for a range of 30 to 90 seconds, variable with valve sizes. Final adjustments shall be made by the purchaser to minimize line surges during normal operation.
- K. Actuator Testing:
1. Performance Tests: Each actuator and valve assembly shall be cycled a minimum of three (3) times prior to assembly to the valve and in the field using the start and stop controls from the fully closed to the fully open position to demonstrate that the complete

assembly, including controls, operates properly.

2. Test Certification: Certification of tests and copies of test or certificate of conformity reports shall be provided on request if the request is made prior to the time of testing.

L. Bracket and Couplings:

1. Custom fabricated bracket to adapt the actuator to a new or existing valve shall be heavy wall carbon or stainless steel material and shall retain the valve stem packing or provide for use of the original draw-down packing gland as required.
2. All brackets and couplings shall be bare stainless steel or carbon steel with baked epoxy or nylon powder finish.
3. Couplings shall be made of bar stock stainless or carbon steel.

M. Acceptable Manufacturers:

1. Kinetrol USA, Inc., 1085 Ohio Drive, Plano, TX 75093, 972-447-9443
2. Engineer pre-approved equal

2.2 OPERATOR AIR TUBING

- A. Air piping on valve operators shall be flexible Polyurethane tubing, flexible PTFE hose with braided stainless steel cover or rigid stainless steel tubing. Air piping shall be sized according to actuator size.

2.3 VALVE ACTUATOR SCHEDULE

TABLE 2.3.A.									
Valve Reference	Valve Type	Valve Size	Qty	Actuator Service	Limit Switch	Position Transmitter	Manual Override	Pneumatic Override	Fail Position
WTW-5A	BFV	12"	5	O/C	Y	N	Y	Y	C
ECV-5B	BFV	24"	5	MOD	Y	Y	Y	N	C
Column Abbreviation Definitions:									
1. Valve Type:	BFV=Butterfly Valve, EPV=Eccentric Plug Valve, BV=Ball Valve								
2. Actuator Service:	O/C=Open-Close, MOD=Modulating								
3. Limit Switch:	Y=Yes, N=No, Suitable for O/C or MOD Actuators								
4. Position Transmitter:	Y=Yes, N=No, Used for MOD Actuators Only (4-20mA feedback)								
5. Manual Override:	Y=Yes, N=No, Handwheel Operated Declutchable Manual Override Gearbox								
6. Pneumatic Override:	Y=Yes, N=No, Pneumatic Manual Override (for temporary local control of actuator)								
7. Fail Position:	C=Close, O=Open, On Power Loss or Control Signal (Air Supply Pressure Remains Present)								

PART 3: EXECUTION

3.1 INSTALLATION

- A. Complete equipment installation with controls, safety devices and auxiliary support systems necessary to start the equipment and verify that the equipment functions correctly under no load conditions. Turn rotating equipment by hand to check. Complete cleaning and testing of piping systems. Inspect and clean equipment, devices, piping, and structures of debris and foreign material.
- B. Remove temporary bracing supports and other construction debris that may damage equipment.
- C. Remove protective coatings and oils used for protection during shipment and installation.
- D. Flush, fill, and grease lubricated systems in accordance with Manufacturer's instructions.
- E. Install temporary connections and devices required to fill, operate, checkout and drain the system. Provide temporary valves, gauges, piping, test equipment, and other materials and equipment necessary to conduct testing and startup.
- F. Check equipment for correct direction of rotation and freedom of moving parts.
- G. Align equipment to Manufacturer's tolerances. Adjust clearances and torques.
- H. Check installation prior to start-up for conformance to Manufacturer's instructions.
- I. Adjust or modify equipment to ensure proper operation.
- J. Correct any deficiencies or problems noted in manufacturer's representative's installation reports.

3.2 FIELD QUALITY CONTROL

- A. Verify that structures, equipment, pipes, valves, fittings, and other appurtenances are compatible. Coordinate field devices, voltages, signal types, power needed, and programming with valve operator to provide proper functioning system.

3.3 MANUFACTURER'S REPRESENTATIVE

- A. The services of the manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of owner's personnel, troubleshooting, acceptance testing, and other services as required within these contract documents.
- B. Manufacturer's representative shall:
 - 1. Approve installation in writing to engineer before operation.
 - 2. Verify conformance to all specified requirements.
 - 3. Fully instruct all designated personnel for the plant on proper care, maintenance, and operation of all equipment and appurtenances.

4. Approve specified acceptance tests to operate system to verify satisfactory operation of all equipment in presence of Owner's personnel and Engineer.
5. Check all equipment for excessive noise or vibration, proper alignment, general operation, etc.
6. Operate the equipment through the design performance range consistent with available flows. Adjust, balance, and calibrate and verify that the equipment, safety devices, controls, and process system operate within the design conditions. Each safety device shall be tested for proper setting and signal. Response shall be checked for each equipment item and alarm. Simulation signals may be used to check equipment and alarm responses.
7. Place each piece of equipment in the system in operation until the entire system is functioning. All components shall continue to operate without alarms or shutdowns, except as intended, for 8 consecutive hours to be considered started up.
8. Submit certified written field reports as required by Section 01301.
9. Provide a certificate by the valve actuator supplier indicating proper installation and start-up procedures have been followed. This certificate shall be required and included as part of the final operation and maintenance manuals to validate the specified warranty.
10. Revisit job sites as often as necessary beyond minimum services specified to correct deficiencies to satisfaction of engineer.

3.4 ACCEPTANCE TEST

- A. Upon completion of the installation of each valve actuator, an acceptance test will be conducted to verify the satisfactory operation and performance of each actuator. Each valve shall be opened and closed using the plant control system as applicable (Auto mode) and manually (Manual mode). The control valves shall also be tested under power loss to verify proper closure.
- B. The test shall be conducted in a manner approved by and in the presence of the engineer. The equipment and piping will be completely checked for leakage, general operation and etcetera.
- C. Each valve actuator must perform in a manner as specified by the engineer before the owner will make final acceptance.

END OF SECTION