

SECTION _____

PNEUMATIC ROTARY VANE C540-02 VALVE ACTUATORS**PULSE CONTROL FOR MODULATING SERVICE**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish, install, startup, and test pneumatic rotary vane AWWA C540-02 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 hard drawn copper 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 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.

1.02 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 within the State of Texas, or shall furnish spare parts within 48 hours of request.
- E. All pieces of equipment 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.

1.03 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 bound neatly in a single package. The following information shall be included as a minimum:
 - a. Manufacturer and model number of all equipment within this specification and a schedule showing all operators 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 with range provided 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
 - 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.

ENGINEER will not review E. Partial or incomplete submittals.

1.04 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 5 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.

1.05 DELIVERY, STORAGE AND HANDLING

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

1.06 WARRANTY

All actuator assemblies shall be warranted for a period of three (3) years from date of shipment. A certificate listing actuator serial numbers shall be provided prior to shipment in order to validate the warranty.

PART 2 - PRODUCTS

2.01 PNEUMATIC ROTARY VANE AWWA C540-02 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. Actuators shall have male output shafts (square) on both sides of actuator to drive valve and accessories. Actuator shall have a vane position indicator milled into the output shaft. One side of the actuator shall be manufactured to ISO/NAMUR mounting standards for attachment of accessories (limit switches, indicators, positioners). Seals shall be double opposed lip seals with stainless steel expanders. Seal backing plates shall be steel. O-ring seals on vane will not be acceptable.
- C. Actuator Materials of Construction:
1. Casing: Pressure die cast A380 aluminum alloy, or A356T51 V-process sand casting with all surfaces coated with thermosetting hybrid polyester/epoxy powder coat with Ultraviolet Inhibitor.
 2. Vane / Output Shaft: Steel ASTM A148 per AWWA C540-2, Grade 115-95, heat treated with electro less nickel plated finish.
 3. Vane Seals: Molded polyurethane.
 4. Shaft Seals: Buna N
 5. Vane Seal Expanders: Stainless spring steel.
 6. Side Plates: Steel with all surfaces coated with thermosetting epoxy powder coat.
 7. Bolting Hardware: All stainless steel
- D. Actuator's Position-Control Capability:
1. **Open/Close Valves:** Actuators shall be solenoid operated. Solenoids for smaller size actuators shall be standard ISO/NAMUR VDI/VDE 3845 direct mounted with the option to be remote mounting for increased accessibility. Solenoid coils shall be 120 VAC 60 Hz NEMA 4 rated. Speed control devices shall allow independent adjustment of OPEN and CLOSE cycling speed. Exhaust air mufflers shall be standard. The manufacturer as a standard shall provide OPEN/CLOSE visual indicator. Provide 80 to 150 psi clean, dry air to solenoid valve. Solenoids to have manual override feature to allow operation of valves in the event of power outage as specified in the PNEUMATIC ACTUATOR SCHEDULE.
 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 when a maximum of 150 psi or a minimum of 80 psi is applied to the actuator. Modulating actuators shall be **Proportional Pulse Controlled**. Solenoids for modulating actuators shall be five ported dual-coil center block with manual locking override capability. Power to either coil will open or close the valve. On loss of power, the valve remains in the last position. Solenoids shall be suitable for operation on a 120 volt, single phase power supply.
- E. **Limit Switches for OPEN/CLOSE and MODULATING Actuators:** Limit Switches shall be housed in a vapor tight, corrosion resistant enclosure with FM and CSA ratings for NEMA 4X areas. Enclosures to have screw-on clear polycarbonate cover with viton seal. Drive shaft for feedback limit switch cams to be stainless steel, Teflon lubricated with viton O-ring seals. Valve position indicator shall consist of prominent "OPEN" and "CLOSE" indicators. Two (2) solid-state limit switches with High Intensity LED indication shall be provided, including integral voltage spike and current surge protection to insure computer compatibility. Limit switches shall be rated 2.0 Amps 125 VAC/DC inrush and 0.30 amps @ 125 VAC/DC continuous. Limit switches shall be adjustable by press, turn and release motion requiring the use of no

- tools. Terminal strip shall be an integral part of the limit switch assembly labeled to indicate upper and lower switch wiring. Direct mounted solenoids shall be pre-wired and labeled to the limit switch terminal strip. Mounting shall be ISO/NAMUR VDI/VDE 3845 standard using stainless steel through bolts and stainless steel bracket. Enclosure shall have one ½ -inch NPT and one ¾ -inch NPT opening as standard. Valve monitors shall be as manufactured by Stonel .
- F. Accessories such as limit switches, positioners, solenoid valves, speed controls, piping and tubing, as required by the specification, shall be mounted by the actuator manufacturer to the actuators prior to shipment to the jobsite.
- G. 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 published torques.
- H. 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.
- I. 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.
- J. The pneumatic actuators shall have a minimum working pressure of 150 psig per AWWA Standard C540-2 with an overload pressure of 220 psig. Actuators rated for 100psig maximum operating pressure will not be acceptable.
- K. 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. The opening and closing speeds shall be nominally set for a range of 30 to 60 seconds, variable with valve sizes. Final adjustments shall be made by the purchaser to minimize line surges during normal operation.
- L. Operating air pressure shall be maintained on the actuator at each end of its stroke, unless other means are provided to prevent drifting.
- M. Manual override: Valve operators shall have a pneumatic manual override operation and/or manual gear override operators with hand wheel as specified in the PNEUMATIC ACTUATOR SCHEDULE.
- N. Actuators shall not require more than five (5) psig to be cycled a complete stroke in each direction before they are connected to the valve.
- O. Actuator Testing:
1. Three (3) types of actuator tests are required, a proof-of-design test, a performance test and a pressure test. The purpose of the proof-of-design test is to prove that the design, material selection, and manufacture of the actuator are suitable for the purpose intended as defined by this standard. The purpose of the performance test is to prove that each actuator is in working order prior to shipment. Actuators shall meet the requirements for each type of test.
 2. Proof-of-Design Tests: One (1) production sample of each pneumatic actuator size shall be tested. Should the actuator design be changed or modified so as to affect its strength of function, the test shall be repeated in accordance with the requirements of AWWA C504 (latest edition).
 3. Performance Tests: Each actuator and valve assembly shall be cycled a minimum of three (3) times 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.
 4. Pressure Tests: Each actuator shall be tested at the overload pressure. The duration of this test shall be sufficient to allow visual examination for leakage and shall be a minimum of one (1) minute.
 8. 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.
- P. Bracket and Couplings:
1. Custom fabricated bracket to adapt the K-TORK actuator to the new valves shall be heavy wall rectangular carbon steel tube 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 have part numbers stamped into each part.
- 3. All brackets and couplings shall have electro statically applied fusion bonded nylon powder coated finish.
- 4. Couplings shall have a flat machined on the coupling for visual indication of valve disk position.
- 5. Couplings shall be made of bar stock carbon steel with keyway and stainless steel setscrew.

Q. Acceptable Manufacturers:

- 1. K-Tork, International, Inc. valve actuators shall be supplied by Controls International, Inc., 10410 Vista Park Road, Dallas, Texas 75238 Telephone number (214) 343-9980
- 2. **Approved equal**

2.02 OPERATOR AIR TUBING

Air tubing on valve operators shall be **polyurethane or stainless steel**. Air tubing shall be sized according to actuator size. As a minimum 1/4-inch on smaller actuators, 3/8-inch on larger actuators.

2.03 EXISTING PNEUMATIC ACTUATOR SCHEDULE

Valve	Type	Size	Quantity	Operator Type	Maximum Differential Pressure	Manual Gear Override	Fail on power loss	Pneumatic Manual Override	Limit switch Quantity	Position Transmitter	Solenoid location
New Valves											
A.											
B.											
C.											
D.											
E.											
F.											
G.											
H.											
I.											
J.											

2.03 NEW PNEUMATIC ACTUATOR SCHEDULE

Valve	Type	Size	Quantity	Operator Type	Maximum Differential Pressure	Manual Gear Override	Fail on power loss	Pneumatic Manual Override	Limit Switch Quantity	Position Transmitter	Solenoid location
New Valves											
A. Check Valve Bypass	Plug	3	6	Open/Close	?	N	Open	Y	2	Y	Integral
B.											
C.											
D.											
E.											
F.											
G.											
H.											
I.											
J.											

PART 3 - EXECUTION

3.01 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.

3.02 FIELD QUALITY CONTROL

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.

3.03 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. Perform specified acceptance tests and 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 in order to validate the specified three (3) year warranty.
 10. Revisit job sites as often as necessary beyond minimum services specified to correct deficiencies to satisfaction of ENGINEER.

3.04 ACTUATOR MOUNTING

- A. Actuator Mounting Responsibility: Valves to be actuated shall be shipped to the manufacturer's approved Valve Automation Fabricator (see AWWA C504-94, Section 1.6, Assembly) for complete assembly, calibration, and testing in order to validate the three (3) year warranty. A certification of the calibration, testing, and warranty shall be included in the final O&M manuals.
- B. Retrofit Actuators: Valves to be retrofit with new pneumatic actuators shall remain in place during retrofit process unless otherwise shown on the plans. Each size and model valve shall be field surveyed by the Valve Automation Fabricator. The survey by actuator representative shall include supervising the removal of the existing actuator, if necessary, in order to measure the top works of the valve. Brackets that bolt the actuator to the valve shall be heavy wall rectangular carbon steel tube and shall retain the valve stem packing or provide for use of the original draw-down packing gland as required. Couplings shall be of bar stock carbon steel. All brackets and couplings shall be furnished with a fusion bonded, oven-cured Nylon powder coat finish for corrosion resistance. The supplier shall supervise the

mounting, installation, and testing of the new retrofit actuators.

3.05 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) and manually. 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, etc.
- C. Each valve actuator must perform in a manner acceptable to the ENGINEER before final acceptance will be made by the OWNER.

END OF SECTION