ENGINEERING CLARIFICATION

EC TITLE: Energy Dissipating Control Valves Tag Numbers Clarification
PROJECT: 3 Kings Water Treatment Plant

EC NO.: 28
DATE: 6/18/2020
STATUS: Acknowledged

SECTION 1: BY CONTRACTOR

QUESTION:

A few of the energy dissipating control valves had incorrect tag numbers in the specifications.

DRAWING NO.:
SPECIFICATION SECTION: 40 27 02.02Energy Dissipating Control Valves

POTENTIAL COST IMPACT:
POTENTIAL SCHEDULE IMPACT:

PROPOSED SOLUTION:

See revised specification Section 40 27 02.02 and an update to Page 11 of the Process Control Narrative in Section 40 96 00.

COMMENTS:

INITIATOR: Zalla, Joseph/SLC

PRIORITY: Normal
REQUESTED RESPONSE DATE: 7/2/2020

SECTION 2: BY REVIEWER

RESPONSE:

COMMENTS:

REVIEWED BY: Sam Conant

REVIEWED DATE: 6/23/2020

SECTION 40 27 02.02
ENERGY DISSIPATING CONTROL VALVES

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish horizontal in-line, axial flow, energy dissipating control valve with assemblies up to ANSI Class 300, complete with electric modulating type actuator for flow control and isolation, factory tested, and operable, as shown on Drawings, and as specified herein.

B. The following valves apply to this specification:

1. FCV-~~053~~-103-01.
2. FCV-120-108-~~03~~.04
3. FCV-120-118-03.

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1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI):
   a. B1.20.1, Pipe Threads, General Purpose (Inch).
   b. B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
   c. B16.5, Steel Pipe Flanges and Flanged Fittings.
2. American Iron and Steel Institute (AISI):
   a. 304, Austenitic Stainless Steel (maximum percent: 0.08C, 2.0 Mn, 1.0 Si, 18-20 Cr, 8-10.5 Ni).
   b. 420, Martensitic Stainless Steel (minimum percent: 0.15C, maximum percent: 1.0 Mn, 1.0 Si, 12-14 Cr, 0.0 Ni,).
3. ASTM International (ASTM):
   a. A48, Specification for Gray Iron Castings.
   b. A216, Specification for Steel Casting, Alloy, Specially Heat-Treated, for Pressure Containing Parts, Suitable for High Temperature Service.
   c. A536, Specification for Common Requirements for Iron Castings for General Industrial Use.
   d. A743, Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.

1.03 SUBMITTALS

A. Submittal shall be prepared in accordance with Section 01 33 00, Submittal Procedures.

B. Action Submittals:

1. Shop Drawings:
   a. Drawings showing plan, cross-section, dimensions, critical clearances, installation requirements, associated spool sections required for installation and long-term maintenance or removal of valve, and all interconnections and interface requirements (piping, actuator, ports, venting devices, etc.). Identify separately mounted components, connections to other Work, critical clearance requirements, interconnections and interface requirements, and the validated hydraulic configuration.
   b. Manufacturer's data and descriptive literature. Include catalog data, detailed construction sheets showing materials of construction with applicable USA material specification for all valve parts, and a list of recommended spare parts. Identify each valve by tag number to which the catalog data and detail sheets pertain.
   c. Performance curves developed for each application showing head differential across energy dissipating control valve in pounds per square inch (psi) versus flow rate in gallons per minute (gpm) for the valve in the positions of 0 percent to 100 percent open in 10 percent increments.
   d. Calculated noise levels, at each operating condition, measured in A-weighted decibels (dBA).
   e. Cavitation analysis for the entire operating range, prepared, stamped, and signed by a Professional Engineer registered in the State of Utah.
   f. Calculations for each valve and operating condition, prepared, stamped, and signed by a Professional Engineer registered in the State of Utah:
      1) Maximum torque required to open and close the valve, including required duty rating and torque output at duty rating.
      2) Valve actuator torque capacity.
      3) Valve shaft sizing.
      4) Minimum controllable flow.
      5) Minimum pressure loss at maximum flow.
      6) Maximum torque capabilities of the operator mechanism and the operating torque requirements for each valve under the specified operating conditions.
   g. Weights of each valve assembly and major components and anchoring criteria for design of structural support by the Engineer.
   h. Provide a complete list of all actuators being provided with their associated tag names as shown on the Drawings and/or Specifications, and the size of the valve they are actuating.

i. Assembly drawings that clearly shows dimensions and orientation of valve actuators as installed on the valves. Clearly show location of internal stops for gear actuators. Provide valve actuator safety verification through the complete stroke specifically noting values for both break torque under maximum differential as well as maximum dynamic torque. Valve manufacturer's compliance shall be factory signed and dated.

j. Actuator product data and literature, including:
   1) Make and Model
   2) Specifications and identification of materials of construction.
   3) Electrical ratings, including voltage, number of phases, starting and running current, voltage levels and source for control and status.
   4) Description of integral control interface.
   5) Remote control station components if applicable.
   6) Environmental ratings, including NEMA enclosure rating and submergence capabilities.
   7) Travel time from full closed to full open.
   8) Allowable starts per hour.
   9) Gearbox data including gear ratio for both manual and motorized actuation, and gearbox efficiency.
   10) Opening and closing directions.
   11) List of options and accessories.
   12) Wiring diagrams including all options and expansion cards furnished with each actuator.
   13) Listings of normal starting and running currents, and full nameplate data from the motor.
   14) Electric motor data.

k. Shop coating and lining specifications, which clearly identify all valve linings and coatings, if applicable.

l. Coating and lining test reports that report and verify the valve interior lining condition is tested for absence of holidays, and lining thickness, if applicable. Describe test results and repair procedures for each valve. Do not ship valves to Project Site until the reports have been approved by the Engineer and accepted by the Owner.

m. Purchaser Furnished Data: Subject to Engineer approval.

n. Equipment delivery and storage requirements: unloading, unpacking, and installation instructions.

o. Startup and shutdown sequence and procedures.

C. Informational Submittals:

1. Valve summary data sheet that provides the station, valve structure, type, manufacturer, size, pressure rating, minimum and maximum flow valve opening percentages, zeta value upstream and downstream, drilling pattern and model number of each valve; and type, manufacturer and model number of the valve actuator.
2. Hydrostatic test reports, functional performance test reports, and any other required test reports. Hydrostatic test reports shall be presented which reflects the requirement of the test procedures.
3. Factory export packaging specifications, applicable to overseas shipping via surface carrier.
4. Quality assurance program certificate of compliance.
5. Furnish Operations and Maintenance Manual for valve(s) in accordance with Section 01 78 23, Operation and Maintenance Data.
6. Manufacturer's Certificate of Compliance and Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

1.04 EXTRA MATERIALS

A. Furnish, tag, and box for shipment and storage 1 complete set of special tools required to maintain or dismantle the energy dissipating control valve.

1.05 QUALITY ASSURANCE

A. Manufacturer shall be ISO 9001 and ISO 14001 Certified.

B. Shop Inspection: The manufacturer shall provide a 4-week advance notice to the Engineer prior to performing tests, and shall allow full access to designated Owner's representatives for inspection of manufacturing facilities and processes, and any specified testing. The manufacturer shall perform all testing at manufacturer's cost, unless such testing is specifically indicated to be provided by the Owner.

C. Shop Testing: Energy dissipating control valves shall be shop tested prior to shipment in accordance with the following minimum standards:

1. Hydrostatic Test: Energy dissipating control valves shall be hydrostatically tested to withstand 1.5 times of the valve's maximum design operating pressure rating. Zero leakage is allowed in either direction.
2. Functional Performance Test: Energy dissipating control valves shall be subjected to an operational/test using potable water. The test procedure shall include three complete open/close cycles of operation with the

valve actuator settings in place (limit switches, torque switches, pilot pressure settings, etc.).

1.06 EXPERIENCE AND SERVICE RESPONSE

A. The valve manufacturer shall have a minimum of 10 years of experience in the production and sales of energy dissipating control valves. The valve manufacturer shall also have at least 25 installed energy dissipating control valve references that have been in operation in the last 5 years.

B. The valve manufacturer shall provide 24-hour manufacturer's response for any field service requirement. Approved service agents, licensee(s), or representatives of the manufacturer shall be permitted. The valve manufacturer shall be responsible for its authorized agents and licensees. A detailed manufacturers signed service call write up, inclusive of photo-documentation, shall be provided without exception, by the valve manufacturer. The valve manufacturer shall be required to know and keep data files on all work performed, modifications and remediations as well as the agents performing the work. This data shall be permanently kept with the manufacturer regardless of licensee.

1.07 WARRANTY

A. The energy dissipating control valve manufacturer shall warrant its products, including actuators incorporated in the work, to be free from defects in materials, workmanship and performance for a period of 5 years from the date of recording the Notice of Completion. Upon notice by the Owner, any damage or defect found during the warranty period shall be promptly repaired or replaced by the manufacturer at no cost to the Owner.

PART 2 PRODUCTS

2.01 GENERAL

A. Manufacturer shall furnish all components required including the energy dissipating control valve, actuator, orifice plate (if required), aeration system (if required), base plate, fasteners, painting, and all other components required for a complete functional valve assembly.

2.02 PERFORMANCE REQUIREMENTS

A. Performance: Each valve shall be designed to operate smoothly throughout the specified flow range without cavitation, excessive noise, or vibration for the conditions stated below.

1. Valve design shall include, if recommended by manufacturer, cavitation control features to break the heads and flows as specified in this Section.
2. Debris caught in the control trim or piston shall not influence smooth operation of the controlling element. This criteria does not apply to those types of items (i.e., woody, fibrous or hard particles) which would inherently plug the control trim openings to a significant degree.
3. Valve manufacturer shall notify Engineer in writing of any risk of cavitation damage to the piping downstream of the energy dissipating control valves due to the operating conditions indicated on Drawings and Specifications and suggest elongating straight piping downstream of the valve if such modifications are deemed needed to protect the downstream piping from cavitation damage.

B. Noise: Operating noise levels shall not exceed 85 decibels (dBA) at a distance of 3 feet from the valve at the normal flow point. Material stresses shall not exceed 1/5 of the ultimate or 1/3 of the yield strength of the material.

C. FCV-~~053~~120-103-01, Pigging Waste Valve Operation Data : Intended valve use is to provide flow control and energy dissipation for breaking head during pipeline pigging operations. EC 28

1. Performance: The Manufacturer shall size, design, and guarantee the valve to operate throughout its range without cavitation, excessive noise or vibration, for the conditions stated as follows:

Parameter	Design Point 1 (Maximum Flow)	Design Point 2 (Minimum Flow)
Flow (gpm)	1,200	350
Inlet Pressure (psig)	275	297
Outlet Pressure (psig)	0	0
dP (psig)	275	297

2. The valve will discharge to approximately 300 feet of 8-inch piping and then into a concrete basin (Backwash Waste Basin) at atmospheric pressure as shown on the Drawings. The basin discharge invert elevation is approximately 15 feet below the energy dissipating control valve centerline elevation.
3. Operating Function: Modulating/throttling flow control valve, expected to operate up to 5 days per year. Valve shall function as modulating flow control valve with flow setting and flow “dead band” width setting selected by operator. Flows will be read at a flow meter upstream of valve.

4. Minimum closure time from fully open to fully closed shall be 120 seconds.

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D. FCV-120-108-~~03~~04, Judge Turbine Bypass Valve Operation Data: Intended valve use is to provide flow control and energy dissipation for breaking head when the hydropower turbine, configured in parallel, is offline.

1. Performance: The Manufacturer shall size, design, and guarantee the valve to operate throughout its range without cavitation, excessive noise or vibration, for the conditions stated as follows:

Parameter	Design Point 1 (Maximum Flow)	Design Point 2 (Minimum Flow)
Flow (gpm)	2,500	570
Inlet Pressure (psig)	200	288
Outlet Pressure (psig)	0	0
dP (psig)	200	288

2. The valve will discharge to approximately 10 feet of piping and then into a concrete basin (Judge Chamber) at atmospheric pressure as shown on the Drawings
3. Operating Function: Modulating/throttling flow control valve, expected to operate up to 365 days per year. Valve shall function as modulating flow control valve with flow setting and flow "dead band" width setting selected by operator. Flows will be read at a flow meter upstream of valve.
4. Minimum closure time from fully open to fully closed shall be 120 seconds.

E. FCV-120-118-03, Rockport Turbine Bypass Valve Operation Data : Intended valve use is to provide flow control and energy dissipation for breaking head when the hydropower turbine, configured in parallel, is offline.

1. Performance: The Manufacturer shall size, design, and guarantee the valve to operate throughout its range without cavitation, excessive noise or vibration, for the conditions stated as follows:

Parameter	Design Point 1 (Maximum Flow)	Design Point 2 (Minimum Flow)
Flow (gpm)	1,700	350
Inlet Pressure (psig)	64	66
Outlet Pressure (psig)	0	0
dP (psig)	64	66

2. The valve will discharge to approximately 10 feet of piping and then into a concrete basin (East Ditch Chamber) at atmospheric pressure as shown on the Drawings
3. Operating Function: Modulating/throttling flow control valve, expected to operate up to 365 days per year. Valve shall function as modulating flow control valve with flow setting and flow "dead band" width setting selected by operator. Flows will be read at a flow meter upstream of valve.
4. Minimum closure time from fully open to fully closed shall be 60 seconds.

2.03 DESIGN FEATURES

A. Body:

1. The energy dissipating control valve shall be a one-part body design with interior geometry that provides water flow that is guided around a streamlined internal body. The design shall feature a geometrically optimized design to eliminate cavitation and manage velocity at all operating conditions. The valve inner body containing the piston movement shall be integral with the outer body shell.
2. The design of the annular throat cross section in any position of the piston shall ensure linear regulation of flow. Flow rate as a function of pressure drop across the valve shall be linear to within 3 percent.
3. Valves shall be provided with a minimum of 2 integral lifting lugs. The lifting lugs shall be integral to the body casting or factory drilled and tapped. They shall be sufficiently broad in placement to assist with rigging of an unbalanced load.
4. Flanged connections shall mate with adjacent flanges as specified in Section 40 27 00, Process Piping and as shown on the Piping Schedule.

B. Control Trim: Custom designed anti-cavitation control trim shall be fixed within valve body or integral to piston. The control trim shall be field removable and replaceable with alternate control trim when hydraulic conditions change, or new operating parameters are required.

C. Piston Mechanism:

1. The piston shall move in an axial flow direction to reduce or enlarge the annular flow cross-section through the control trim. Flow will pass from the outer annular chamber to the inner chamber through the control trim.
2. Energy dissipating control valve design shall feature advance and retract axial strokes of the piston, guided in the internal body by an internal tooth-rack transmission or slider-crank mechanism driven by a worm

gear in accordance with AWWA C542. The piston shall be contained in the axial position through its movement.

3. Guide rails, if required, shall be completely fused to the valve body in an overlay weld process to prevent any gaps or corrosion pathways. Guide rails which are bolted to the valve body are not acceptable for long-term operability and corrosion protection. Guide rails, if required, shall be positioned around the piston in a quantity to reduce the potential for damaging harmonic vibration, clogging or excessive wear. The guide rails shall be low to no lead and very low zinc content to prevent dezincification.

D. Stem: The valve stem shall have linear transmitting motion connecting to the piston rod, thus determining valve opening position.

E. Seals:

1. The seals design and location shall allow the valve to be drip and bubble tight in both flow directions for the long term. The seals shall be insensitive to debris. The elastomeric profile sealing ring shall seat leak tight against the piston when in the fully closed position. The profile sealing ring shall not be penetrated by fasteners, exposed to the flow stream in the open position, and shall not be subject to cold flow of the elastomer.
2. The valve operating shaft shall have PTFE lip seals or O-ring seals. The seals shall maintain a drip tight seal regardless of modulation cycles or inactivity. Valve shaft seals shall prevent the long-term potential of water entering into the gear case.

F. Drive:

1. The movement of the piston shall be controlled by one of the following methods:
   a. An trapezoidal drive-nut, driven by an electric actuator, that transfers the actuator shaft rotations into a linear stem movement. This vertical stem movement shall be transferred into an axial movement of the piston by means of a maintenance-free and dead-band free angled tooth rack transmission.
   b. Maintenance free irreversible, self-locking, quarter turn, worm gear unit in accordance with AWWA C542 with externally adjustable mechanical stops to limit valve travel in both the open and closed positions. The valve stroke shall equal 90 degrees plus or minus 2 degrees, whereby the mechanical stops of the worm gear shall be engaged before the full extension or retraction of the piston. In no instance shall the full output torque of actuator be allowed to be transmitted to the valve at its end of travel, either

open or closed, without engaging the travel stops of the worm gear first. The worm gear unit shall be operated by an electric actuator.

2. Motion shall be controlled by means of an electric actuator for modulating service attached to the body section. Actuate energy dissipating control valve as specified in Section 40 27 02, Process Valves and Operators.

G. Base Plates. Submit and obtain approval for, and provide, base plates for energy dissipating control valve. Base plates must be able to be unbolted to remove the valve from the adjacent process piping by sliding the valve up to 3 inches horizontally away from the upstream flange before it is lifted vertically. Base plates shall be designed to secure valve to a reinforced concrete base.

2.04 MATERIAL REQUIREMENTS

A. Principal Component Parts Materials of Valve Construction:

Item	Size	Material	Specification
Valve Body	All	Steel or Ductile Iron	ASTM A487 CA6NM or ASTM A536, GR. 60,40,18
Piston	All	Stainless Steel	AISI 316L
Control Trim	All	Stainless Steel	AISI 316L
Shaft Bushing	All	Bronze	ASTM C90800/CuSn12
Crank Shaft	All	Stainless Steel	AISI 420
Crank Mechanism	All	Stainless Steel	AISI 304
Seat/Retaining Ring	All	Stainless Steel	AISI 316L
Guide Rails	All	Bronze welded overlay	CuAl8 (lead <0.0020% Zinc < 0.008%
Sealing-Ring	All	EPDM or PTFE	Hardness A: 80, (=/- 5). Elongation >200%, Tensile >12 N/mm, Elasticity >25%

Item	Size	Material	Specification
Profile Sealing Ring	All	EPDM or PTFE	Hardness A: 80, (=/- 5). Elongation >200%, Tensile >12 N/mm, Elasticity >25%
O-Rings, Actuator Shaft	All	EPDM	Hardness A: 80, (=/- 5). Elongation >200%, Tensile >12 N/mm, Elasticity >25%
Worm Gearbox	All		Housing: Ductile Iron GGG-40 Worm Wheel: GGG-60 or bronze Coupling: Quenched and tempered steel acc. to 10083-2 Input Drive Shaft (Secondary Gear): Stainless steel 10088-3

B. Fasteners: All studs, bolts, washers, and nuts in contact with water shall be Type 316 stainless steel.

C. All materials of moving components in contact with each other shall be of dissimilar hardness to prevent galling. The valve shall be moved through an open-close-open cycle three times after final assembly and prior to shipment to ensure this requirement.

D. The valve manufacturer coating process shall include post preparation and coating application assurances of targeted performance. The manufacturer shall utilize and incorporate a QC process that includes Coating thickness Testing, Holiday Free Testing, Cross Linkage Testing, Impact Resistance Testing, Coating Adhesion Testing and Cathodic Disbonding Testing. The Quality Compliance testing shall remain on record with the manufacturer and available for review and approval.

E. The valve shall be blast coated to near white metal in accordance with SSPC Specifications SP 10. Coating shall take place within 12 hours of the blast cleaning process.

F. The applied coating shall be tested, signed, and dated-verified holiday free with a dry film thickness as specified in Section 09 90 00, Painting and Coating, System No. 5.

2.05 INSULATING FLANGE

A. Bolt holes on FCV-~~053~~120-103-01 downstream flange shall be over-drilled to accommodate installation of insulating flange kit. See Drawings for requirements.

2.06 AERATION DEVICES AND ORIFICE PLATES (IF REQUIRED)

A. Where specifically indicated, the anti-cavitation venting device shall be mounted directly downstream of the energy dissipating control valve with air intake connecting piece on the top of venting system. The venting shall be in annular flow shape directly at the outlet of the energy dissipating control valve.

B. The anti-cavitation venting device shall be manufactured out of ASTM A283 steel with one flat faced ANSI/ASME B16.5, Class 150 at upstream side, flanges with one flat faced ANSI/ASME B16.5, Class 150 at downstream side, flange on the top of anti-cavitation venting device.

C. Manufacturer shall determine is an orifice plate downstream of the energy dissipating control valve is required for valve performance requirements. If required, orifice plate shall be sized and warranted by energy dissipating control valve Manufacturer. Orifice plate shall be manufactured out of AISI Type 316L stainless steel. Final location of orifice plate shall be reviewed and approved by the Engineer during Shop Drawings review period.

2.07 ENERGY DISSIPATING CONTROL VALVE MANUFACTURER

A. Mokveld, RZD Series

B. VAG-Armaturen GmbH, RIKO.

C. Or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Valve installation shall be in strict accordance with the manufacturer's printed recommendations, and the Contract Documents.

B. Install valve and supports such that excessive loads are not induced on valve flanges.

C. Actuator orientation to be installed as shown on Drawings.

D. Anchorage and bracing shall be in according to Section 01 88 00, Anchorage and Bracing.

3.02 WORKMANSHIP

A. Valves shall be free from manufacturing defects and shall be manufactured under the direction of a registered professional Engineer.

B. Painting shall be as specified in Section 09 90 00, Painting and Coating, System No. 5. Grease and scale shall be completely cleaned from the valve prior to painting per Society for Protective Coatings (SSPC) standards.

C. All carbon steel components shall be painted with fusion bonded epoxy in accordance with System No. 29 in Section 09 90 00, Painting and Coating. A Certificate of Compliance with the purchaser's material specifications, and the manufacturer's quality assurance program shall be furnished with each valve.

3.03 FIELD TESTING AND PERFORMANCE

A. Manufacturer shall furnish all required startup assistance and inspection of installed valve at the Owner's facility.

B. Energy dissipating control valves shall be subjected to onsite performance testing as part of the commissioning activities in accordance with a written performance test plan. To the extent possible, the valve shall be subjected to variable flow conditions, and the resulting control settings, flow, upstream and downstream pressures, noise levels, and vibration levels shall be documented and compared to the manufacturer's shop test results. Operational flow testing shall be performed on each valve to verify the following:

1. Simulate valve operation using local and remote control.
2. Operate valve at maximum flow demonstrating maximum allowed pressure drop across the valve.
3. Operate valve from minimum to maximum flow. Using the specified electric motor actuators, operate valve–actuator assemblies demonstrating the ability to adjust flows at increments of 5 percent of maximum design flow throughout the full stroke range. This testing and valve cycling need not occur at the full heads the valves will experience when operating within their normal system operations. For all tests record flow, upstream and downstream pressure, valve position set points and actuator motor inrush current. Submit all test results of forecasted operating curves and actual test results.
4. Demonstrate successful "high-pressure" cavitation control operations without damage to the valve or downstream piping facilities.
5. Demonstrate that the valve meets specified noise requirements.

6. In-place (Field) Leakage Test: Contractor shall perform in-place (Field) Leakage Test regardless of which operational flow test method is selected: Field leak test all valves to the specified system tests pressure in the closed position with zero leakage. After verifying zero leakage to Engineer satisfaction, exercise each valve through its full stroke at least two times during the second phase of pressure testing and system disinfection.
7. All Operational Flow Testing and In-place (Field) Leakage Tests performed during the construction period (not the 5 year warranty period) and shall be witnessed by the Engineer and manufacturer's representative. Test results shall be jointly certified by Engineer or its representative, manufacturer's onsite representative, and the Contractor.
8. If the valve fails any of the tests, it shall be corrected by the manufacturer within 7 days at the manufacturer's expense.

3.04 MANUFACTURER SERVICES

A. Manufacturer's Representative: Present at Site or classroom designated by Owner for minimum person-days listed below, travel time excluded:

1. 1/2 person-day for installation assistance and inspection.
2. 2 person-days for functional and performance testing and completion of Manufacturer's Certificate of Proper Installation.
3. 1/2 person-day for prestartup classroom or Site training.
4. 2 person-day for facility startup.

B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

C. Provided Operation and Maintenance Manuals shall be in accordance with Section 01 78 23, Operation and Maintenance Data.

END OF SECTION

System Description and Operation Facility 120

Judge and Rockport MH (P&ID 060-N-12002 and 12003)

The overall Plant Flow Set-point will be established by summing the combined Online Filter Effluent Flows. The number of Online Filters and required Plant Flow setpoint will be set by the plant operator and will be evenly distributed across each filter.

Flow_WTF Total/ # Online MHs = Flow Setpoint for each MH

This Plant Flow Setpoint will be evenly divided between the Rockport and Judge MH.

The total flow through the Judge MH system is derived from FIT-120-106-01 (Flow into the Turbine) and FIT-120-108-03 (Bypass Flow). FIT-120-106-01 is the amount of flow required to produce the requested KW from the Judge Turbine and should be steady. FIT-120-108-01 will vary according to the position of FCV-120-108-04 which in turn modulates to maintain its flow setpoint. FV-120-102-02 is used to isolate raw water from the Judge MH Turbine and to Jet Injection.

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The total flow through the Rockport MH system is derived from FIT-120-116-02 (Flow into the Turbine) and FIT-120-118-01 (Bypass Flow). FIT-120-116-02 is the amount of flow required to produce the requested KW from the Rockport Turbine and should be steady. FIT-120-118-01 will vary according to the position of FCV-120-118-03 which in turn modulates to maintain its flow setpoint. FV-120-116-01 is used to isolate raw water from the Rockport MH Turbine.

MH Chamber Flow Control

All plant Raw water ends up in one of three chambers: Portal Chamber. Judge Chamber, or Prioritized Chamber. Each has a Modulating gate that discharges into Rapid Mix.

GTE-120-122-02

GTE-120-124-02

GTE-120-126-02

GTE-120-132-01 (To Rapid Mix)

GTE-120-132-02 (To Rapid Mix)

Raising each gate will force water to overflow back into its respective Chamber. Lowering the gate will allow water to flow to Rapid Mix. Flow through each gate can be calculated by the following formula. Water Height over each weir gate (h) is calculated using water level from the respective chamber.

Portal Chamber LIT-120-122-01

Judge Chamber LIT-120-124-01

Prioritized Chamber LIT-120-126-01