

HINGED CREST GATE SYSTEM

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	87 N-0361-01	2011	90	169

MKEC
ENGINEERING
CONSULTANTS, INC.

411 N. WEBB ROAD
WICHITA, K.S. 67206
316-684-9600

PART 1 - GENERAL

1.01 SCOPE:

- A. This specification covers the design, manufacture, supply and installation of the hinged crest gate system. The system shall include the gate leaf, hinges and brackets, sealing system, anchorages, hydraulic cylinders, cylinder supports, seal heaters, air vent piping, water level sensors, hydraulic power unit, automatic controller, local control panel, gate position indicators, painting and/or metalized surfaces, transportation to the site, drawings, installation procedures, and operation and maintenance manuals. All other appurtenances and effort necessary to deliver a fully operational Hinged Crest Gate System shall be subsidiary.
- B. The contractor shall submit the following information for review as part of the bid package:
- Project experience sheets of three (3) previous installations of similar projects
 - Color photos of each project
 - References for each project
 - A generic hinged crest gate system has been shown in the plans. If the contractor proposes significant changes to the design of the hinged crest gate, the contractor shall submit a set of details of the modifications for the approval of the Design Engineer.

1.02 QUALITY ASSURANCE

- A. The manufacturer shall have experience in the production of substantially similar equipment and shall show evidence of satisfactory operation in at least 5 installations. The manufacturer's shop welds, welding procedures and welders shall be qualified and certified in accordance with the most recent revision of AWS D1.1.
- B. The Hinged Crest Gate System shall be inspected by the city prior to shipping.
- C. The manufacturer of the hinged crest gate system shall provide an onsite installation supervisor throughout the installation of the hinged crest gate system. The installation supervisor shall have at least 5 years experience of installing hinged crest gate systems. It is the responsibility of the installation supervisor to ensure all work conducted in the field is in accordance with the manufacturers requirements and the completed system is properly installed. Upon installation completion the installation supervisor shall provide written documentation that the gate was installed as recommended by the manufacturer. At a minimum the installation supervisor shall be present onsite for a construction/planning meeting with the installation Contractor and Owner prior to shipment of the equipment, after placement of anchor bolts in primary pour concrete prior to placement of the hinge brackets and gate leaves, erection of each gate leaf, dry operation of the assembled gates, start up of the hydraulic power unit and wet testing of the hinged crest gate system. All costs associated with the installation supervisor shall be subsidiary to the hinged crest gate system.
- D. The manufacturer of the hinged crest gate system shall provide an onsite technician with 5 years experience maintaining hydraulic hinge crest gate systems to provide system demonstration and hands on training for City of Wichita staff. Training shall consist of 40 hours of implementing onsite operations and maintenance tasks listed in the provided operations and maintenance manual. All costs associated with onsite technician shall be subsidiary to the hinged crest gate system.

1.03 SUBMITTALS

- A. All shop Drawings shall be sealed by a professional engineer in the state of Kansas.
- B. Shop drawings shall identify all principal dimensions, materials and construction. Provide sealed structural calculations necessary for the design, construction and installation.
- C. Shop drawings shall include an erection plan for gate installation. Erection plan shall indicate all crane locations and lifting procedures.

PART 2 - PRODUCTS

2.01 DESIGN CODES AND REFERENCE WITH LATEST REVISIONS

- AISC 13th Edition
- ACI 318
- AWS D1.1
- AWS C2.18-93R

2.02 OPERATION

- A. The completed gate installation shall be operated by a SCADA control system which is included in the contract but paid for separately from the Hinged Crest Gate System. Specifications for the system are outlined in Section 16 of these Supplemental specifications. Items covered in section 16 include software, input/output hardware, instrumentation, and all devices, accessories, appurtenances, testing, and training required for proper operation of the system.
- B. The System Supplier shall be R.E. Pedrotti Company, Inc., Mission, KS or Engineer or Owner approved equal. The proposed system shall be compatible with existing systems within the storm water department. Contact Mr. Scott Lindebak, P.E., City of Wichita Storm Water Engineer (316) 268-4545 for information related to existing systems.
- C. The operations system shall be designed for only one (1) gate to move at any given time. In general the expected step for each gate shall be increments of approximately 3" of elevation. The incremental step shall be adjustable by software.
- Automatic - The operating system shall automatically monitor the upstream water elevation and position the gate leaf to maintain a constant water elevation under varying flow conditions using data from upstream sensors.
 - Manual - Provisions shall be made to raise or lower any gate via manually actuated controls located on the local control panel.
 - Bypass - Provisions shall be made to allow for bypass of all control systems and lower the gates. When subjected to the flood head it shall be possible to lower the gate to the fully lowered position by manually opening a bypass system at the hydraulic power unit.

2.03 GENERAL DESCRIPTION OF GATE LEAF

- A. The gate shall be arranged to lower and open. Each gate shall have a clear waterway opening of 56 ft. The effective top of gate elevation in the raised position shall be 1284.5 ft.
- B. When in the fully raised position the leaf shall lean downstream approximately 20' from vertical. The gate will rotate approximately 70' from the fully raised to the fully lowered position. In fully lowered position gate shall be at or below elevation 1274.5ft.

2.04 DESIGN REQUIREMENTS

- A. The gate hoisting system shall have sufficient thrust capacity to raise the leaf from the fully lowered position to the fully raised position when the upstream water level is at elevation 1284.5 ft. or 10ft above the fixed crest.
- B. The gate shall be structurally designed to withstand the worst combination of static and dynamic loadings at any position with the upstream water surface at a fixed level of elevation 1291.5 ft.
- C. Concrete Supports for Gate System - Concrete pier and gate operator supports have been shown for a generic dam design specific dam supports may need to be changed for a specific manufacture. These necessary changes will be accomplished by the Design Engineer in coordination with the gate manufacturer's Engineer. These changes will be accomplished as a result of the original construction contract without additional cost to the owner or contractor.

2.05 GATE COMPONENTS

- A. Leaf -The leaf shall consist of a float plate and vertical diaphragm plates. The curved plates shall be ASTM A709 Grade 50 steel (Fy=50ksi). The remainder of the leaf structure will be ASTM A36 structural steel or equivalent. A curved Type 304 stainless steel surface shall be provided directly above the gate hinges to mate with the horizontal J-seals. The top edge of the upstream skin plate shall form a discharge lip of a design to minimize flow induced vibrations. Provide knap breakers along the weir edge of the gate.
- B. Bearings - The gate leaf shall rotate on pin type hinges. The hinge pins shall be stainless steel and fixed to the gate leaf. The pins will rotate in permanently lubricated bronze bushings which shall be retained in fabricated or cast steel bearing brackets. The brackets shall be anchored to the concrete structure in a manner to allow adjustment in all three planes during erection of the leaf sections.
- C. Seal Support Members - The side seals shall be designed to seal in all leaf positions. The seal shall be attached to the ends of the leaf. The side seals shall be fluoro-carbon clad neoprene. The seal attachments shall allow for replacement of the seal without removal of the leaf. The side seal plates shall consist of a stainless steel plate with seal reinforcing on the backside. The seal shall resist flow to a maximum leakage of 0.1 gallons per minute per linear foot of seal.
- D. Connections to dam structure shall be designed to allow adjustment in all three planes during erection of the leaf sections. Provide full structural details of all connection construction procedures. Shop drawings should include surface preparation details if casting against existing concrete.
- E. Erection and Maintenance Supports - Erection struts and associated brackets shall be provided to support the leaf in the full up position with the operator detached from the leaf. Maintenance supports shall be designed to support the full design high water loading.
- F. Lifting attachments - Gates shall be designed and fabricated with lifting attachment points. These points should facilitate installation and long term maintenance of the gate system.
- G. Leaf Supports - When the leaf is in the fully lowered position the weight of the leaf shall be supported by adjustable gate stops contacting pads on the downstream surface of the spillway.
- H. Air Vent Piping - It shall be the responsibility of the gate manufacturer to determine the necessity of air vent piping and to determine the size, location and shape of the air vent piping system. The air vent piping shall be hot dip galvanized steel or equivalent and have protective screens on both the inlets and outlets.

2.06 HYDRAULIC POWER SYSTEM

- A. It shall be the responsibility of the gate manufacturer to design, test, supply and install a complete hydraulic operating system and controls to meet the performance requirements of the owner.

2.07 CYLINDERS

- A. The hydraulic system shall have a maximum design operating pressure 3000 psi. Cylinders shall be tested at 150% of design pressure.
- B. The hydraulic system shall adjust the gate at a minimum speed of 1inch of elevation per minute.
- C. Include internal position sensing electronics that indicate position throughout the cylinder stroke. Provide full maintenance procedures for sensor removal and installation in operations and maintenance manual. Provide a removable steel cover to protect sensors from damage from birds, weather or debris.
- D. Cylinders shall be mounted above the gate as shown on the plans. Cylinders shall raise the gate by retraction and open the gate by extension. All cylinders shall be dual acting under pressure. All cylinders shall be identical.
- E. The cylinder supplier shall have a service technician located within the United States of America. Cylinders shall be fabricated in the United States of America.
- F. Hydraulic fluid specified in the design shall be a non-toxic, biodegradable, and environmentally friendly vegetable-oil-based fluid.

2.08 HYDRAULIC POWER UNIT

- A. Hydraulic power unit shall be electrically powered. A power input connection shall be provided for auxiliary power input. Coordinate any additional power requirements for electrical system and generator with electrical plans. Any modifications to electrical plans and components required shall be subsidiary to the hinged crest gate system.
- B. The hydraulic power unit reservoir shall contain a minimum of 200 gallons.
- C. Provide a redundant pump system with two identical pump and motor units. Each pump and motor unit shall operate the dam individually.
- D. Provide necessary controls compatible with description of operation which also interface to SCADA SYSTEM.
- E. Clearly label each hydraulic line and connection on the hydraulic power unit.
- F. Provide printed signage for emergency lowering of all gates using bypass valves.
- G. Shop drawings shall denote equipment size and weight to ensure compatibility with the design of the maintenance structure. If modifications are necessary changes will be accomplished by the Design Engineer in coordination with the gate manufacturer's Engineer. These changes will be accomplished as a result of the original construction contract without additional cost to the owner or contractor. Once shop drawings are reviewed install HPU in the control building.

2.09 HYDRAULIC LINES

- A. Design, supply and install properly sized stainless steel lines from the HPU to the hydraulic cylinder. Short flexible armored lines shall be allowed only for the final cylinder connection to the cylinder.
- B. Delivery lines between tees and cylinder ports shall be of a standard equal length. An equal length of plumbing shall be provided to the pressure port of each cylinder on either side of a gate.
- C. All valves, fittings, tubes and hoses shall be rated for a factor of safety of 6 against bursting pressure for the design system pressure.
- D. Install hydraulic lines from the control building on the maintenance structure.

PART 3 - EXECUTION

3.01 MANUFACTURE

- A. The gates and associated components shall be fabricated in sections that are convenient for shipment and field erection. All major components shall have lifting ears, eyes and /or lugs arranged to facilitate handling during site offloading and erection.
- B. All welding and welding procedures and qualifications, and welder qualifications shall be in accordance with the most recent revision of AWS D1.1.
- C. Each gate leaf shall be completely assembled in the manufacturer's facility. The gate pivot bores shall be sighted to assure correct alignment of the centers. Each hinge bracket shall be assembled to the leaf at its respective location and the bracket rotated through its full range of operating swing. All mating parts shall be trial fitted. During shop assembly the gates shall be checked for dimensions for tolerances, accuracy of alignment and squareness.
- D. An operational test of the hydraulic and electric control system shall be made to demonstrate proper functioning of the system, including functioning and sequencing of all control and alarm devices. The hydraulic cylinder shall be hydrostatically tested in the cylinder manufacturer's facility, at a pressure of 150% of the hydraulic power unit design pressure.

3.02 FINISHING

- A. Surface preparation (All exposed steel surfaces)
- SSPC-SP10/NACE 2 Near-White Metal Blast Cleaning.
 - The removal of all grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter by compressed air nozzle blasting, centrifugal wheels or other specified method. Discoloration caused by certain stains shall be limited to no more than 5 percent of each unit area. Unit area is approximately 9 in2 (6400m2).
 - Install coating on prepared surface within 8 hours.
- B. Paint System (Cylinders, Cylinder Supports):
- Prime Coat: Tnemec 90-97 Tnemecinc applied at 2.5 to 3.5 mils dft.
 - Intermediate Coat: Tnemec Series N69 Hi Build Epoxoline II applied at 3.0 to 6.0 mils dft.
 - Finish Coat: Tnemec Series N69 Hi Build Epoxoline II applied at 3.0 to 6.0 mils dft.
 - Color will be selected by the City. Provide color chart with submittal.

C. Metalize (Gates)

- Prepare surfaces in accordance with 3.02 A.
- COATING: 0.014-0.016 inches of 85/15 zinc/aluminum metalizing
- All work shall meet AWS C2.18-93R

Operator shall be qualified by written and material testing denoted in AWS C2.16/C2.16M

SUMMARY OF QUANTITIES

HINGED CREST GATE SYSTEM

HINGED CREST GATE SYSTEM	1	L.S.
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**LINCOLN STREET BRIDGE AND
DAM IMPROVEMENTS OVER
ARKANSAS RIVER**

HINGED CREST GATE GENERAL NOTES

SHEET TITLE
472-84883
PROJECT NUMBER

JAG
DESIGN BY
DMU
DRAWN BY
KJS
CHECKED BY

ISSUED
1/24/2011
REVISED

SHEET NO.
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