SECTION 14600
BRIDGE CRANES AND HOISTS

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for a complete design and installation of all double girder bridge cranes, trolleys, hoists, and accessories. All equipment shall be installed, adjusted, tested and placed in operation in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

B. Contract Drawings show only functional features and some of the required external connections. They do not show all components required for a complete installation nor exact dimensions particular to any manufacturer's equipment. Contractor shall supply all parts, devices and equipment necessary to meet the requirements of the Contract Documents and shall make all dimensional adjustments particular to the equipment being furnished. All costs associated with such changes and adjustments shall be considered as being included in the price bid for the Work shown and specified.

C. Related Work specified elsewhere:

1. Section 05120 - Structural Steel.
2. Section 09900 - Painting.
3. Section 16150 - Electric Motors.

D. All Bridge Cranes specified herein shall be supplied by the same manufacturer.

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:

1. Manufacturer's warranty per the requirements of paragraph 1.05.
2. Manufacturer's certification
3. Design calculations verifying drive and hoists' horsepower; braking and energy dissipation requirements; end stop bumper energy dissipation and maximum force; bridge deflections; rail clam requirement and structural loading on run-way. Specific calculations for operation and deflections due to wind for outdoor cranes shall be included. Calculations shall be sealed by a professional engineer registered in the state of Georgia.
4. Detail of wheel loadings on runway system including number and spacing of wheels, number of drive units and end trucks and end truck spacing.
5. Shop drawing showing clearance dimensions, limits/extent of hook coverage and details of construction including general arrangement, runway, crane rail, complete bridge crane, cables, cable lifting devices and hardware and all product data required for the complete bridge crane installations.

6. Electrical wiring and control diagram, cables, near hatch retention device, cable lifting devices and associated hardware and manufacture product data for hoist.
7. Shop drawings shall be prepared by the equipment manufacture and not sales representatives or fabrication shops
8. Detail drawings showing all connections to support structures.
9. Materials specifications and mill certificates for bridge components.
10. Motor manufacturer cut sheets and literature including bearings, mechanical and electrical components.
11. Operation and maintenance manuals.

1.03 QUALITY ASSURANCE

A. Reference Standards:

1. Comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:
   a. NEC, National Electric Code.
   b. NEMA, Standards of National Electrical Manufacturers Association.
   c. OSHA, Occupational Safety and Health Act.
   d. ANSI, American National Standards Institute.
   e. ASTM, American Society for Testing Materials.
   f. AISI, American Iron and Steel Institute.
   g. NFPA, National Fire Protection Association.
   h. AWS, American Welding Society.
2. Comply with the Crane Manufacturer's Association of America (CMAA) Standards as specified below:
   a. CMAA Specification No. 70 for electric overhead traveling cranes.
   b. All hoists shall be designed for Service Class H4 as described in the Hoist Manufacturer's Institute (HMI) Specifications.
   c. All electrical and control components shall conform to NEC 610.

B. Experience: Equipment furnished under this Section shall be of a design and manufacture that has been successfully used in similar applications. The manufacturer shall have furnished equipment for a minimum of five similar applications. Provide a list of such installations complete with installation description, contact names, addresses, and telephone numbers. This reference list shall be submitted with the shop drawings.

1.04 QUALITY STANDARDS

A. The bridge cranes, monorails, trolleys, and hoists shall be furnished by a single manufacturer who shall assume sole responsibility for providing a complete, operating system designed for long life with a minimum of required maintenance meeting the requirements specified herein and as shown on the Drawings.

B. The Contractor shall assign unit responsibility to the crane manufacturer for all equipment specified in this section. The assignment of responsibility shall not be construed as relieving the Contractor from overall responsibility for this portion of the Work.

C. Manufacturer shall provide written certification that the equipment provided under this Specification has been amply designed and is a suitable application for these service conditions.

D. Manufacturers:

1. Kone Cranes
2. Gajjar Engineering
3. Or Equal

1.05 WARRANTY

A. Provide a warranty against defective equipment and workmanship in accordance with the requirements of the General Conditions of the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL

A. Supports and Auxiliaries: Crane assembly shall include all overhead track, trolley, hoist, end stops, and other track accessories as required for a complete system.

B. Runway beams, brackets, and associated framework shall be furnished and installed by the Contractor in compliance with the requirements of Section 05120 - Structural Steel and as shown on the Drawings.

C. Design Parameters

1. Design of traveling crane assembly shall be based upon the use of a safety factor of 5, applied to the capacity for all load bearing parts of the crane, hoist and trolley. The safety factors shall be based upon the ultimate strength of the materials used.
2. Design calculations for all structural members shall include all live and dead loads and all live and dead load impacts and shall be carried out in accordance with the methods stipulated by the CMAA.
3. Bridge girder deflection shall not exceed 1/888 of the span.

D. Wiring: All wiring and wire sizes shall be in accordance with the latest issue of the National Electrical Code

2.02 SERVICE CONDITIONS

A. The crane equipment shall be rated NEMA 4X stainless steel.

2.03 BRIDGE CRANES

A. General Requirements: Structural steel used in fabricated parts shall conform to requirements of Crane Manufacturers Association of America (CMAA) and ASTM A36. All shop welding shall

be in conformance with the American Welding Society. All anchor bolts shall be 316 stainless steel conforming to the requirements of Section 05120 – Structural Steel. The equipment furnished under this section shall comply with the requirements of ANSI B30.2.0g, Safety Code for Overhead and Gantry Cranes.

B. Assembly: As far as possible, all parts shall be assembled and shop-tested under no-load conditions. Upon disassembly all parts shall be match marked to facilitate erection.

C. Crane and Hoist Schedules:

DESIGN PARAMETERS	BRIDGE	TROLLEY	HOIST
DIVERSION PUMP STATION WET WELL AREA CRANE			
Rated Capacity, lbs.	20,000		20,000
Bridge Crane Span	34'-3"		
Type	Top running - Double girder -		
CMAA Classification	C		
Min. Available Vertical Hook Travel, Ft			54
Services	Outdoor	Outdoor	Outdoor
Full Load Speed, FPM	0 - 100 fpm	0 - 50 fpm	0-25 fpm
Speed Point	Variable	Variable	Variable
Power Supply	460/3/60	460/3/60	460/3/60
Control Voltage, Volt	115	115	115
Motor Speed, RPM	1,800	1,800	1,800
Motor Enclosure Type	TEFC	TEFC	TEFC
Motor Rating (min)	Continuous	Continuous	Continuous
Motor Brake Type	Disc	Disc	Disc & Regenerative
Motor type	Sq. Cage	Sq. Cage	Sq. Cage
Motor insulation (class)	F	F	F
Control Brake Type	Dynamic	Dynamic	Dynamic
Control Type	VFD	VFD	Magnetic
DIVERSION PUMP STATION VALVE ROOM CRANE			
Rated Capacity, lbs.	8,000		8,000
Bridge Crane Span	25'-0"		
Type	Underhung - Double girder		
CMAA Classification	C		
Min. Available Vertical Hook Travel, Ft			15
Services	Indoor	Indoor	Indoor
Full Load Speed, FPM	0 - 100 fpm	0 - 655 fpm	20/3.3 fpm
Speed Point	Variable	Variable	2-speed
Power Supply	460/3/60	460/3/60	460/3/60
Control Voltage, Volt	115	115	115
Motor Speed, RPM	1,800	1,800	1,800
Motor Enclosure Type	TEFC	TEFC	TEFC

Motor Rating (min)	Continuous	Continuous	Continuous
Motor Brake Type	Disc	Disc	Disc & Regenerative
Motor type	Sq. Cage	Sq. Cage	Sq. Cage
Motor insulation (class)	F	F	F
Control Brake Type	Dynamic	Dynamic	Dynamic
Control Type	VFD	VFD	Magnetic
JET MIX PUMP STATION PUMP ROOM CRANE			
Rated Capacity, lbs.	10,000		10,000
Bridge Crane Span	38'-2"		
Type	Underhung - Double girder		
CMAA Classification	C		
Min. Available Vertical Hook Travel			40'-4"
Services	Indoor	Indoor	Indoor
Full Load Speed, FPM	0 - 100 fpm	0 - 50 fpm	0-25 fpm
Speed Point	Variable	Variable	Variable
Power Supply	460/3/60	460/3/60	460/3/60
Control Voltage, Volt	115	115	115
Motor Speed, RPM	1,800	1,800	1,800
Motor Enclosure Type	TEFC	TEFC	TEFC
Motor Rating (min)	Continuous	Continuous	Continuous
Motor Brake Type	Disc	Disc	Disc & Regenerative
Motor type	Sq. Cage	Sq. Cage	Sq. Cage
Motor insulation (class)	F	F	F
Control Brake Type	Dynamic	Dynamic	Dynamic
Control Type	VFD	VFD	Magnetic

D. Then crane design shall maximize the hook coverage areas and heights within each location. The limits specified on the drawings are the minimum coverage requirements acceptable.

E. Other Electrical Equipment: The following electrical equipment shall be provided for the bridge cranes specified herewith:

1. Magnetic mainline contactor.
2. Fused manual safety switch.
3. Thermal overload protection.
4. 4 Runway current collectors - double shoe. (3 collectors plus dedicated ground).
5. Hoist geared upper and lower limit switch.
6. Anti Collision Banner photo eyes.
7. Wind meter, alarm and strobe for outdoor cranes (OSHA required).

2.04 CRANE TROLLEY REQUIREMENTS

A. Trolley Frame: Trolley frame shall be of all steel welded construction and shall be of the top running type. The frame shall be rigidly braced to maintain proper squareness.

B. Trolley End Trucks: Trolley end trucks shall be of welded steel box construction. Trolley end trucks shall be designed to prevent excessive drop in case of machinery breakage.

C. Trolley Bumpers: Bumpers shall be provided at the four corners of the trolley. Bumpers shall be equal to Wampfler Polyurethane.

D. Trolley Wheels: Trolley wheels shall be 12-inch in diameter with a total of four per trolley. Wheels will be double flanged with flat treads. Wheel material shall be forged steel, 58 RC (minimum).

E. Trolley Rail: 60# ASCE rail shall be used and shall be fastened to the top of the girders by welded rail clips.

F. Trolley Wheel Axle Bearings: Bearings shall be spherical roller type, with minimum L-10 bearing life of 10,000 hours. Bearings shall operate on rotating axles.

G. Trolley Drive: The trolley shall be motorized with an AC disc type brake. An A-1 modified trolley drive per CMMA shall be provided. Two trolley wheels shall be driven one, on each side of the trolley.

2.05 BRIDGE CRANE REQUIREMENTS

A. Runway Rails: The runway rails shall be straight, parallel, level, and at the same elevation as required to satisfy CMAA requirements specified herein and shown on the Drawings. Material shall be as specified in the Section 05120 - Structural Steel. The distance center to center and the elevation as measured at running surface of rail or flange shall be within a tolerance of plus or minus 1/8 inch. The runway rails shall be standard ASCE rail sections of the size recommended by the manufacturer and shall be provided with rail splices. (See Section 2.11)

B. Bridge Girders: Bridge girder assemblies shall be constructed of a fabricated structural section or welded plate box as required to provide full unobstructed crane movement above all mechanical equipment shown on the drawings. The girder assemblies shall be designed to the latest specifications of the Crane Manufacturers Association of America. Under full load, girder assemblies shall not deflect in excess of 1/888 of the span.

C. Bridge End Trucks: End trucks shall be of welded steel box construction with ample sized gusset plates for connection to the crane girders. Bridge end trucks shall be designed to prevent excessive drop in case of machinery breakage.

D. The bridge crane end trucks shall have steel wheels hardened to 375 to 425 Brinell mounted on a lifetime lubricated antifriction bearings fitted with seals to exclude dust and moisture. Wheel bases shall be 1/7 of the bridge span or greater. Axles and wheels shall be removable without disturbing other truck elements.

E. Bridge Bumpers: Bumpers shall be provided at the four corners of the crane and shall be equal to Wampfler Polyurethane. Crane shall be equipped with anti collision device to prevent crane-to-

crane contact or crane to end stop contact. Safety lugs shall be provided to limit the drop of the end truck to 1-inch or less in the event of a wheel or axle failure.

F. Bridge Wheels: Bridge wheels shall be 12-inch in diameter with a total of four per crane. Wheels shall be double flanged with taper tread drive wheels and flat tread idler wheels. Wheel material shall be forged steel, 58 RC (minimum).

G. Bridge Wheel Axle Bearings: Bearings shall be spherical roller type, with minimum L-10 bearing life of 10,000 hours bearings will operate on rotating axles.

H. Bridge Drive: An A-4 bridge drive shall be provided. If a dual motor system is used, the operation of the end trucks shall synchronized to assure even bridge travel without binding, jerking or excessive vibrations. Motors shall be reversible

I. Bridge drive reducers shall be at each end truck and shall be helical gear type. The gear motor assembly shall be provided with an electric brake rated at 100 percent of the full load motor torque.

2.06 HOIST REQUIREMENTS

A. Hoist Assembly

1. Hoist shall be of the wire rope type, HMI class H4 service.
2. Provide geared upper and lower limit switches and assure positive stopping under all conditions. An overload cutoff device shall also be provided.
3. Hoist Reeving: The Diversion Pump Station Pump Removal Crane BC0101 hoist shall be of double line reeving, at least 2 part and shall provide a true vertical lift. Other hoists can be single or double reeved to suit the lifting conditions. Hoist drum shall be of steel construction and shall be grooved to hold entire cable length in a single layer. Hoist shall utilize energy dissipating regenerative braking system.
4. Hoisting Rope: The hoist rope shall be of 316 stainless steel and shall be able to lift equipment the height specified, with a breaking strength at least five times the rated load capacity of crane. The ratio of the drum diameter to the type of stainless steel cable diameter shall be according to CMAA and WRTP recommendations, but rope diameter shall not be less than 20 mm.
5. Hoist Gear Box: All hoists gearing shall be in a totally enclosed gearbox. Gearing shall conform to AGMA standards and shall be heat treated, hardened steel, helical type running in an oil bath. Gearbox bearings shall be anti-friction type and have an L-10 bearing life of not less than 10,000 hours. Gearboxes shall be designed for easy draining and replacement of lubricating oil.
6. Running Sheaves: All running sheaves shall be of steel construction.
7. Hook Blocks: All hook blocks shall be of the safety type with all sheaves guarded and equipped with ball thrust bearings and forged steel hooks. Hook shall be equipped with a safety latch.
8. Sheaves shall be of heavy pattern, deep flanged and grooved and shall be either bronze bushed or fitted with ball bearings and supported on fixed pins.

9. Hoisting Unit: The hoisting unit shall be a packaged type hoist as manufactured by Yale or equal.

2.07 MOTORS

A. Motors shall be capable of handling full rated load for the full lift, or travel, at all rated speeds without overheating of the motor or controls. All motors shall be sized to operate at a maximum of eighty percent (80%) of rating when moving one hundred percent (100%) of rated load.

B. Motors and horsepowers shall be established by the crane manufacturer. No hoist motor shall be loaded beyond eighty percent (80%) of its rated capacity disregarding cable, sheave, gear and bearing friction.

C. Couplings: All motor couplings shall be of the flexible type.

D. Provide motor space heaters for all drives and hoist motors to allow operation at lowest winter temperatures and prevent condensation buildup between operations.

E. Outdoor cranes shall be supplied with two 250 watt metal halide down lights, one on each side of the hoist. The lights shall be powered from the bridge crane and not require a separate power supply. The lights shall be controlled from the operator's pushbutton station.

2.08 CONTROLS

A. Hoist Limit Switch: The hoist limit switch shall be so designed that when the hoist block reaches its upper limit of travel the hoist limit switch will either directly, or indirectly through a magnetic contactor or other device, interrupt the current to the hoist motor in the hoisting direction and allow the hoist motor brake to set. The limit switch shall be connected to the circuit in such a manner that it will be possible to lower the hoist block by reversing the controller into the lowering position.

B. Controls:

1. Crane control pendant shall be of NEMA 4X rated enclosures.
2. Main point of control for the cranes shall be from an eight (8) pushbutton pendent suspended from an independent trolley track running the length of the bridge.
3. A hand held radio remote control consisting of one receiver and two transmitters shall also be provided for the Diversion Pump Station Pump Removal bridge crane BC0101. The operation of the crane and associated hoisting equipment shall be operated either by the pushbutton pendent or the remote control. A mutual lockout shall be provided between pendant and remote control.

2.09 PAINTING AND PROTECTIVE COATING

A. All steel items including girders, end truck frames and trolley decks shall be power tool cleaned and shop painted in accordance with Section 09900 – Painting. Bridge crane manufacturer shall provide touch up paint for the Contractor. Touch up paint shall be compatible with the finish coats applied in the shop. Finish color shall be of the safety yellow machinery type.

2.10 NAMEPLATES AND WARNING SIGNS

A. Nameplates shall be permanently attached to the bridge crane systems. Capacity shall be stated in tons of 2,000 lbs. Nameplates shall be clearly legible and shall contain manufacturer's name. Warning signs shall be provided in accordance with ANSI B30.16, Chapter 16-2, affixed to bottom lift blocks.

2.11 ACCESSORIES

A. The bridge crane manufacturer shall provide and install the following accessories:

1. Runway Rail System: Runway rail shall consist of #60 ASCE rail. The runway rails shall be installed on the top of the structural support beams. The rail system shall include all hook bolts, splice plates, and all necessary mounting hardware as required to attach and properly align the runway rails. The length of rails shall be as shown on the Drawings.
2. Electrical Conductor System: The electrical conductor system for the bridge crane shall be a 160 feet, 4 wire Insul-8 conductor system consisting of 640 lineal feet of conductor, insulated dead end assembly, insulated hangars, clip hangers, collector with weather cuff, intermediate supports and end supports. The system shall be mounted adjacent to the bridge crane runway rails. The system shall be fed from a 480 volt, 3-phase, 100-amp electrical service and shall include all necessary mounting hardware. The electrical conductor system shall be provided and installed by the bridge crane manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

A. Prior to erection and installation of equipment specified in this Section, the Contractor shall verify dimensions on the Drawings with field conditions at the start of the work and check continuously during construction. Assemblies and components specified in this section shall be installed in strict conformance with the manufacturer's instructions and recommendations.

B. The Contractor shall furnish oil, grease and lubricants required for initial operation. The grades of oil, grease, and lubricants shall be as recommended by the manufacturer.

3.02 FIELD TESTS

A. After installation, equipment described under this Section shall be inspected by the factory representative for proper alignment, quiet operation, proper connection, and satisfactory performance. After inspection by the factory representative, the system shall be given a full load operating testIn addition, hoisting, traveling, and safety features shall also be tested.

B. Field tests shall be performed in the presence of the Engineer. The Contractor shall produce a report of the test in a format to be reviewed and approved by the Engineer.

C. The Contractor shall furnish the labor and materials required for such tests and shall, at its own expense, correct defects in the fabrication, erection and operation of the system.

D. All structural welds and bolted connections shall be tested in accordance with Division 5 requirements.

3.03 MANUFACTURER'S SERVICES

A. Furnish the services of factory-trained service technician, certified by the manufacturer to service the type of equipment specified in accordance with the requirements of the General Conditions of the Contract Documents and as specified herein.

B. The service technician must have a minimum of five years of experience, all within the last seven years, servicing the type and size of equipment specified.

C. Service technician must be present on site for all items listed below. Work-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.

D. Assistance during equipment installation to include observation, guidance, instruction of Contractor's assembly team, erection, installation procedures, inspection and checking of installation to furnish written approval of installation

1. 1 work-day per crane.

E. Assistance during functional and performance testing and startup demonstration, and product acceptance by the Owner.

1. 1 work-day per crane.

F. Training of Owner's personnel in the operation and maintenance of equipment as required. Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts and preparation to lead and teach classroom session.

1. ½ work-day.

G. For the purposes of this paragraph, a work day is defined as an eight hour period at the Project site, excluding travel time. The Engineer may request that a work day be furnished in a maximum of two trips.

H. Any additional time required of the factory trained service technician to assist in placing the equipment in operation or to correct deficiencies in installation, equipment or material shall be provided at no additional cost to the Owner.

END OF SECTION 14600