



# Resources | Solutions

## SECTION 14630

### TOP RUNNING SINGLE GIRDER BRIDGE CRANE

#### PART 1- GENERAL

##### 1.01 SUMMARY

- A. The work required under this section shall include the designing, manufacturing, shipping, installing and field testing of a top running, single girder, overhead traveling bridge crane with one electric wire rope trolley hoist.
- B. On-site training of operators will be provided by the manufacturer. This will include but not necessarily be limited to: techniques of safe operation, daily and monthly inspections, minor troubleshooting.
- C. Related Sections:
  - 1. Structural Steel
  - 2. Special Coatings
  - 3. Electrical Requirements
  - 4. Basic Electrical Materials and Methods

##### 1.02 REFERENCES

- A. Crane Manufacturers Association of America (CMAA)
  - 1. Specification No. 74 for Top Running & Under Running Single Girder Electric Overhead Traveling Cranes.
- B. American National Standard (ANSI)
  - 1. ANSI B-30.16 Overhead Hoists
- C. Occupational Safety and Health Administration (OSHA)
  - 1. Par. 1910.179 Overhead & Gantry Cranes
- D. Hoist Manufacturers Institute (HMI)
- E. National Electric Code (NEC)
  - 1. NEC (Latest Edition Article 610 Cranes and Hoists)

- F. American Institute of Steel Construction (AISC)
  - 1. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
- G. American Society for Testing and Materials (ASTM)
  - 1. A36/A36M .Specification for Carbon Structural Steel
- H. American Welding Society (AWS)
  - 1. D1.1 - Structural Welding Code - Steel
  - 2. D14.1 - Overhead Cranes

### 1.03 OPERATING SPECIFICATIONS

Capacity:	( ) tons						
Duty Class:	CMAA Class ( ) [ A, B, C or D]						
Span:	( )'-( )"						
Steel:	AISC Hot Rolled Steel Beams, A-992.						
Bridge Girder Deflection:	L/888						
End Trucks:	Dual drive with fixed axles. Motors shall include AC magnetic disc brakes per CMAA requirements. Wheelbase-to-span ratio shall not exceed 7:1.						
Hoist:	Electric wire rope hoist.						
Lift:	( )'-0 above the operating floor with two wraps remaining on drum at lowest hook position.						
Trolley:	Motor driven with two drive wheels and brakes per CMAA requirements.						
Speeds:	<table border="0" style="margin-left: 20px;"> <tr> <td>Bridge</td> <td>0 to ___ fpm, VFD control</td> </tr> <tr> <td>Hoist</td> <td>___ &amp; ___ fpm, two speed control</td> </tr> <tr> <td>Trolley</td> <td>0 to ___ fpm, VFD control</td> </tr> </table>	Bridge	0 to ___ fpm, VFD control	Hoist	___ & ___ fpm, two speed control	Trolley	0 to ___ fpm, VFD control
Bridge	0 to ___ fpm, VFD control						
Hoist	___ & ___ fpm, two speed control						
Trolley	0 to ___ fpm, VFD control						
Voltage:	460 v 3 Ph 60 Hz, 115 volt control.						
Bumpers:	Rubber bumpers on end trucks and trolley per CMAA requirements.						

Enclosures:

NEMA 4, Minimum.

#### **1.04 SUBMITTALS**

- A. Shop Drawings
  - 1. Submit for approval, Shop Drawings showing complete details, dimensions, field coordinates and bills of material for fabrication and erection. Drawings shall include a “Wet Stamp” by a Professional Engineer, duly licensed in the State of ( ).
  - 2. Include member sizes, model numbers, specifications, reactions and complete shop and field notes such as welding symbols, paint requirements, bolt sizes, etc.
  - 3. Submit complete calculations for member sizes, horsepower, design criteria and seismic calculations stamped as per (1.) above.
  
- B. Product Data
  - 1. Provide information on all components, sub-assemblies, control systems, mechanical features, etc. relating to the equipment supplied under this specification.
  - 2. Include brochures, catalog cuts, parts breakdowns, operation and maintenance manuals, clearance diagrams, dimensional data (not supplied in the shop drawings) and any other data necessary for the engineer to determine compliance with specifications.
  
- C. Wiring Diagrams
  - 1. Provide complete, integrated wiring diagrams for all the equipment provided under this specification on crane supplier’s letterhead. Catalog cuts will not be acceptable.

#### **1.05 QUALITY ASSURANCE**

- A. Crane suppliers shall have documented experience of ten (10) years, having successfully designed and built installations of similar scope.
  
- B. Crane suppliers shall be responsible for providing equipment of highest quality and workmanship which will perform specific functions reliably and safely and allow required maintenance procedures with a minimum amount of interference to operation of the equipment.
  
- C. A copy of the crane supplier’s Quality Assurance Plan shall be made available to customer for review prior to award.
  
- D. Equipment not meeting all requirements of this specification will be replaced with compliant components at no additional cost to the owner.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Unloading and storage of crane shall be under the direct supervision of manufacturer.

## **PART 2 .PRODUCTS**

### **2.01 MANUFACTURERS**

- A. All major components shall be manufactured in the USA and complete repair parts shall be stocked locally by the crane supplier. All controls shall be interchangeable as much possible.
- B. Hoists, trolleys, bridge end trucks, drives and controls shall all be from only one supplier and shall meet the requirements of this specification.

### **2.02 RUNWAY ELECTRIFICATION**

- A. The runway conductors shall be Figure-8, rolled galvanized steel bar. The minimum capacity of the conductor bar shall be 110 amp or larger to carry the necessary ampere load without undue heating.
- B. A four conductor configuration shall be provided with all brackets, hangers, splice covers, power feeds, expansion gap assemblies and collectors as required by manufacturer.
- C. When Variable Frequency Drives are provided, tandem collector shoes shall be provided.

### **2.03 RUNWAY BEAMS and RAILS**

- A. Runway beams shall be designed to meet the requirements of AISC. Beams, bracing, end stops, and electrification brackets shall be supplied by the crane manufacturer.
- B. Beam sizes, connection details, bracing, etc., shall be clearly shown on the stamped design drawings submitted by the crane supplier. The top flange of the runway beams will be braced to the building structure at each support point
- C. Rails shall be ASCE rails, sized according to the crane wheel loads. Rails, splice bars and bolts shall be supplied by the crane supplier.
- D. The runway rails shall be attached to the runway beams using hook bolts, rail clips or clamps, as determined by the crane supplier.

## **2.06 BRIDGE CRANE**

- A. Crane Girder
  - 1. Girders shall be designed to resist all vertical, horizontal and torsional forces.
  - 2. Bridge girders shall be new, ASTM A992 Hot Rolled structural steel shapes or welded box girders designed to meet the requirements of CMAA.
  
- B. End trucks
  - 1. End trucks shall be constructed of structural steel tubes, providing a rigid structure. Design shall allow easy wheel removal and exchange.
  - 2. End trucks shall be fitted with shock absorbing bumpers.
  - 3. Crane wheels shall be high strength ductile iron, machined with double flanges and straight treads, flame hardened to 300 Bn. Wheels shall be sized to meet the minimum allowable wheel loads per CMAA. The wheel axle assembly shall rotate on dual high quality anti-friction, lifetime lubricated bearings having a minimum life of 5,000 hours.
  - 4. The end truck to girder connection shall be bolted for easy removal of end truck. Bridge girder shall be coped to provide the highest possible positioning of the runway beams.
  
- C. Bridge and Trolley Drives
  - 1. Bridge drives shall employ fixed rotating axles with totally enclosed motors. Trolleys shall employ two drive wheels.
  - 2. Motors shall be TENV, Class F insulated with a temperature activated switch in the windings, 30 minute rated, 1800 RPM.
  - 3. The gear reducers shall be fully enclosed with oil bath for gears.

## **2.07 WIRE ROPE HOIST**

- A. Hoist Motor and Braking System
  - 1. Hoist motor shall develop sufficient power to lift the rated load at the specified speed. Motors shall be TENV, Class F insulated with a temperature activated switch, 30 minute rated, 1800 RPM. Hoist motor shall not be placed inside of hoist drum.
  - 2. The hoist shall have a DC rectified disc type motor brake. Brake material shall not contain asbestos.
  
- B. Hoist Gearing
  - 1. Hoist gearing shall be helical, heat treated alloy steel and shall operate in an oil bath.
  
- C. Hoist Drum and Rope
  - 1. The rope drum shall be welded construction, deep grooved and precision

- machined to give maximum rope life. Drum shall be supported at each end by sealed anti-friction bearings.
2. The hoisting rope shall be of a proper design and construction for hoist service. The rated capacity load divided by the number of parts of rope shall not exceed 20% of the breaking strength of the rope.
  3. Double wrapping of the rope shall not be permitted. A drum rope guide shall be provided. A minimum of two wraps shall remain on the drum with the hook in the lowest position.
  4. Bottom block shall have a totally enclosed housing fabricated of steel. The rope sheaves shall be supported on an anti-friction thrust bearing. Hook shall be a single barbed type hook and shall be equipped with a heavy spring safety latch.
  5. Hoist shall be equipped with upper and lower limit switches as well as a redundant block operated upper limit switch. The switches shall be adjustable to set the extreme upper and lower limits of hook travel.
  6. Hoist shall be equipped with an overload device to prevent lifting loads in excess of 125%.

## **2.08 BRIDGE ELECTRIFICATION AND CONTROLS**

### **A. Electrification**

1. To supply the electrical power across the crane for bridge, trolley and hoist motions, a flat cable festoon system shall be utilized. The flat cable shall be extra flexible with color coded wires according to NEMA standards. Wire shall be stranded copper per CMAA.
2. The trolleys that carry the flat cable shall have steel wheels with sealed ball bearings. The c-track that the trolley operates in shall be a minimum of 14 gage galvanized metal.
3. Flat cable connectors shall be heat shrinkable, corrosion resistant and flame retardant

### **B. Controls**

1. Bridge, trolley and hoist controls shall be mounted in NEMA 4 enclosures.
2. A magnetic mainline contactor, controlled by momentary on/off switches on the pushbutton shall be included.
3. A control transformer shall be provided with separate and isolated primary and secondary winding, all copper wound. Control voltage shall not exceed 120 volts.
4. Hoist functions shall be controlled by magnetic contactor.
5. Bridge and trolley functions shall be controlled by separate variable frequency drives.
6. All controls shall be sized to meet ambient temperatures. A cooling system will be provided for each enclosure when the ambient temperature exceeds the maximum allowable operating temperature of the individual electrical components.

- C. Pendant Station
  - 1. A NEMA 4, pendant station will be provided with a separate pushbutton for each direction. A red mushroom head “off” switch and a separate “on” switch shall be supplied. Operators shall be two-speed.
  - 2. The enclosures shall have durable, clearly marked legend plates, guards to protect switches from damage or accidental actuation and shall allow for right or left hand operation. Arrangement shall be as used on other existing cranes in the facility.

## **2.09 PAINTING**

- A. All structural steel shall be cleaned of rust and mill scale with a minimum SSPC-6 “commercial blast” cleaning.
- B. Cranes shall be painted with 2.0 mil DFT Primer & 2.5-3.0 mil DFT Safety Yellow Industrial Enamel.
- C. Hoists shall be painted per the Hoist manufacturer’s standard coating. Hooks shall not be painted.
- D. Structural components shall be painted with 2.0 mil DFT Primer & 2.5-3.0 mil DFT Gray Industrial Enamel.

## **2.10 MISCELLANEOUS**

- A. Quality and Spare Parts
  - 1. To properly serve the crane users needs of after sales service and spare parts, the manufacturer shall have local availability of service and spare parts.
- B. Factory Testing
  - 1. Following complete assembly of the crane in the factory, all components shall be tested to insure correct operation.
  - 2. Push-buttons shall be tested for operation of each movement.
  - 3. All motors shall be phased correctly in the factory for proper operation.

## **2.11 INTERCHANGEABILITY**

- A. Provide like parts on components furnished which are interchangeable and give particular attention to items that may require replacement or adjustment during the life of the crane.

## **2.12 SAFETY DEVICES**

- A. Each crane will be provided with all safety devices required by federal, state or

local law.

- B. Each Crane will be provided with a capacity plate with 3 inch high letters on each side of the crane giving the capacity in tons.
- C. Cranes shall be supplied with a readily accessible power disconnect on the bridge, adjacent to or part of the control panel.

### **2.13 MATERIALS**

- A. All materials shall be new and meet the requirements of CMAA, HMI, NEC and NSI. All load bearing parts shall have a 5:1 factor of safety.
- B. Structural steel used in the fabrication of bridge girders and end trucks shall be new and meet the minimum ASTM standards.

### **2.14 SHIPPING**

- A. After factory tests are completed, disassemble the crane into major components for shipment with all major points of attachment match-marked to facilitate final assembly, and all exposed finished parts coated with compound before shipment. Properly pack all small parts in boxes with parts identification clearly marked on the outside of each box.
- B. The crane manufacturer shall pay all costs of packing, loading, shipping and unloading of the crane at the job site.
- C. Crane manufacturer shall replace all parts of the cranes that are damaged or lost in shipment without cost to the Owner.

## **PART 3 -EXECUTION**

### **3.01 CRANE ERECTION**

- A. The crane supplier shall receive, unload, and erect the cranes in accordance with applicable codes and specifications as referenced in the beginning of this specification. Installers shall be employees of the supplier and have five years experience installing overhead cranes.
- B. Holes shall not be drilled or flame cut in any part of trusses or other parts of the building structure without permission from the customer's Engineer of Record (EOR).
- C. Welding to the building structure must also be approved by the EOR.



### **3.02 ELECTRICAL WORK**

- A. The crane installer shall provide all wiring and electrification in accordance with the National Electric Code.

### **3.03 FIELD QUALITY CONTROL**

- A. Acceptance Test
  - 1. Conduct testing for final acceptance after the erection work has advanced to the point that inspection and testing can proceed without interruption.
  - 2. Allow inspection of all parts of the crane containing electrical parts or moving mechanical parts by the Engineer.
  - 3. Test the cranes for capacity, speed and deflections in the presence of the Engineer and owner with 125 percent of the hoist capacity load on the hook. Test weights shall be supplied by Owner unless otherwise negotiated with crane supplier.
  - 4. Crane supplier will transmit to the owner a certificate of load test and compliance with OSHA requirements.

### **3.04 TRAINING**

- A. Following the acceptance testing, the crane supplier will provide up to 8 hours of instruction and field training of operators to meet the requirements of ANSI B30.2 and OSHA 179.1 for Operator Training.
- B. The instruction will include but not necessarily be limited to: techniques of safe operation, daily and monthly inspections, minor troubleshooting.
- C. The field training will consist of having the operators actually operate the crane and perform a daily inspection.
- D. A written exam will be conducted to insure the operator's understanding and compliance with the required codes of conduct.

**END OF SECTION**