SECTION 146300 - BRIDGE CRANES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes bridge crane systems.
   1. Include, but not limited to, the complete cost of labor, equipment, materials, shipment, installation and training.

B. Furnish full time technical supervision for the erection and testing of equipment specified. Labor, material and equipment for testing of the cranes is to be provided.

1.3 SYSTEM DESCRIPTION

A. Load carrying parts shall be designed so that the calculated static stress in the material, based on full rated load, shall not exceed 20 percent of the assumed average ultimate strength of the material used. The hoist ropes shall have a safety factor of 5 to 1.

B. Specific items detailed in the specifications, which exceed the below standards, and codes shall take precedence.

1.4 REFERENCES

A. Chrysler LLC:
   1. SMI-101 Cranes, Chains, Wire Rope (Cable) and Slings Safety
   2. SMI-146 Safety Inspection of Overhead Hoists Systems


C. American Society of Mechanical Engineer:
   1. ASME B30.2-1996 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

D. Crane Manufacturers Association of America, Inc. (CMAA) No. 70 for Electric Overhead Traveling Cranes, Revised 2004. The crane shall be designed for the service class identified on the schedules of Part 3. Coordinate electrical equipment installation with other building components, and the work of other Contracts.

E. Occupational Safety and Health Act 1910.179, Overhead Cranes.
1.5 SUBMITTALS

A. Shop Drawings: Submit each of the following drawings:
   1. General arrangement of bridge, wheel loads, bumper heights, trolley, hook blocks, certified hook contour drawings, schematics, wiring diagrams, radio control drawings and reeving diagrams, as applicable.

B. Record Drawings: Submit one 24" by 36" of each of the following drawings:
   1. General arrangements of bridge, access points for bridge maintenance, wheel loads, bumper heights, trolley, hook blocks, gear cases, schematics, wiring diagrams, radio control drawings, reeving diagrams, board level schematics of electrical components.

C. Operation And Maintenance Manuals: Submit three copies to the Owner's Representative. Manuals shall be delivered after installation and load test of each crane.
   1. Service manuals shall contain complete operation and maintenance information including the following:
      a. Equipment designation and serial numbers.
      b. Equipment weights and the weights of major components.
      c. Full instructions for installing, operating and maintaining equipment, including board level schematics of the drive control system.
      d. Repair parts lists and drawings including O.E.M. part numbers for commercial parts.
      e. Schematic, wiring, lubrication, hydraulic, air and piping diagrams with sequence of operation.

1.6 QUALITY ASSURANCE

A. The Vendor shall provide the names and phone numbers of five contacts where similar equipment like that contained within this specification was supplied and installed during the last three years.

1.7 WARRANTY

A. The Vendor shall guarantee the machinery and/or equipment, regardless of final inspection and acceptance, against defective workmanship, design or material for two years from date of acceptance of the work.

B. Upon written notice of any such defects, the Vendor will promptly, at his own expense, make good such defects. Any other work affected, including work of subcontractors, in making good such defects must also be made good by the Vendor at his own expense.
1.8 OWNER’S INSTRUCTIONS

A. Training shall be in accordance with the "Chrysler Corporation Equipment Supplier Training Specifications" dated February 26, 1990.

B. Population to be Trained: 12

1.9 MAINTENANCE

A. Spare Parts: Bid price is to include one year spare parts, based on estimated usage. List of spare parts to be furnished prior to award. Example: (Shoes/Brake Coils/Fuse Set).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Crane Technologies Group, Inc.
   2. Versa Handling
   4. Whiting Corporation
   5. P&H/Morris Material Handling
   6. Mt. Clemens Crane

2.2 MATERIALS

A. Structural Steel: ASTM A36 or ASTM A992, Grade 50.

B. Bolts: ASTM A325, unless otherwise specified.
   1. Bolts and fasteners that may loosen due to crane operation must be Witness Marked (Matched Marked) for ease of validation in identifying if the bolt or fastener becomes loosened.

2.3 COMPONENTS

A. Crane Bridges
   1. Girders shall be wide flange or built-up plate construction. Any required web plates shall fit accurately under the top flange/cover plates. Trolley rails shall rest directly over the centers of the girders to evenly distribute the load. End clips shall be fastened to the girders at rail ends to prevent creeping rails.
      a. Provide squaring marks on each girder to facilitate erection and squaring of the bridge. Connections shall be made with high-tension bolts in drilled and reamed holes.
      b. Camber girders to an amount equal to the dead load deflection plus one half the live load and the trolley deflection.
      c. Maximum deflection under full load shall not exceed L/800.
      d. Design full depth diaphragms for maximum torsional resistance at points of concentrated loads, such as motor supports and cross shaft bearing pedestals.
There shall be a full depth diaphragm behind each cross shaft bearing mounting to prevent flexing and fracturing of the web.

e. Intermediate or short diaphragms shall be provided as required to transmit loading directly to the web plates.

2. Trolley rails, of suitable size for the trolley wheel loading and of standard ASCE or crane rail section, shall be secured with rolled steel clips welded to the top cover plate of the girders. Provision shall be made to prevent creeping of the trolley rails by means of a positive stop at the ends of the rail. Locate rails in center of girder so the loads will be distributed evenly between all bridge wheels.

3. Crane Wheels:
   a. Crane wheels shall be forged or rolled steel, accurately sized in pairs to carry the maximum wheel load on the size rail for each crane.
   b. Wheel shall be double flange type. Hardness shall be a minimum 65 Rockwell deep hardened.
   c. Wheels are to be pressed on and driver wheels keyed to axles. Driver wheels shall be mated to within 1/32” on the diameter.
   d. The crane shall have a standard, straight, one-piece end trucks

4. Bridge Drives:
   a. On cranes provide A-4 type drives with individual motors, reducers, and controls to insure that both ends of the crane travels at the same speed and bridge brakes do not set with full torque when controller is moved to “OFF” position.

B. Hoist Trolleys
   1. Frame shall be welded rolled steel construction. Connect trolley sides by a structural steel girt to provide perfect alignment. If trolley is of such size that it can be shipped in one piece, the girt shall be welded to the side frames; forming a one-piece trolley frame. Trolley shall be rigidly constructed throughout to transmit the load with undue deflection in the trolley rails. Provide safety lugs to prevent drop of more than 1” in case of axle or wheel breakage.
   2. Trolley travel drive shall consist of motor, motor brake, oil-tight gear case, flexible couplings and shafts connected to drive wheels.

C. Hoist Mechanism
   1. Hoisting rope shall be 6 X 37 IWRC or per approved package hoist. Use of metric rope is not allowed. The rated load plus hook block weight divided by the number of parts of rope shall not exceed 20 percent of the nominal breaking strength of the rope. Provide guards between the girders to prevent the hoisting ropes from contacting main line conductors.
   2. Hoisting drum shall be rolled steel or centrifugally cast steel and so designed that not less than two full turns of rope remain in the grooves when the hook is in its lowest lift position and not requiring overlapping of rope when in its highest position. The grooves shall be turned right and left hand from the solid metals. Pitch diameter of the drum and running sheaves shall be a minimum of 20 times the rope diameter. Pitch diameter of the idler sheaves shall be a minimum of one half the running sheaves or 12 times the rope diameter. **Single reeved hoists are not acceptable.**
3. Load blocks shall be all welded steel construction. Sheaves shall be heavy duty steel with deep flange machine cut grooves. Sheaves shall be flame hardened and lifetime lubricated. Hooks shall be high quality forged steel supported from a threaded solid steel nut mounted on an enclosed grease packed ball or roller thrust bearing seated in accurately finished surfaces. The design and material of the hook shall be such that it shall open gradually before breaking on excess load beyond the safety factor of the specified load. Substantial close fitting steel guards shall be provided to prevent the ropes from becoming fouled or leaving the sheaves when the hook block is laying on the floor with ropes loose. Hooks shall be furnished with safety latches. Load blocks shall be clearly and permanently marked with the lifting capacity.

4. Hoist gear reduction housings shall be oil tight. The complete housing shall be removable from trolley frame.

D. Bearings
1. Bearings shall meet the provisions of CMAA No. 70.
2. Bearings shall be anti-friction type throughout with a guaranteed minimum B-10 life of 10,000 hours.
3. Bearings shall fit into machined bearing blocks and be so designed that the bearing assembly and outer raceways are easily removable. Bearings shall be provided with means of lubrication. The use of self-aligning bearings held in unmatched surfaces is not acceptable.

E. Motors
1. Motors shall be specifically designed for inverter duty crane service and tested in accordance with the latest applicable standards of C.S.A. and U.S.A. Standards D 6.1 (terminal markings for electrical apparatus), C 50 (rotating electrical machinery) and NEMA Standards MG-1 (motors and generators) unless otherwise specified. Motors shall be squirrel cage motors, totally enclosed, non-ventilated, 1200 or 1800 RPM, rated 440 volts, 3, phase, 60 hertz.
2. All motors shall be externally mounted, to allow ease of maintenance.
3. Motion motors to be squirrel cage, crane duty type rated 60 minute with Class F insulation as required for adjustable frequency control.
4. Motors shall have a projected B-10 life of at least 10,000 hours in accordance with I.E.E.E. test procedure #117 or #275. A.C. motors shall have a NEMA duty rating of one hour minimum. Motors shall be specifically designed for crane service.
5. Hoist motors shall be manufactured by Reuland Electric, or approved substitute, made to be used with Flux Vector control.
6. Bridge and trolley motors shall be manufactured by Reuland Electric Series "XI", or approved substitute, for use with inverters.

F. Brakes
1. Brakes shall set automatically when power is interrupted for any reason. Brakes shall be built to AISE Standards and shall be AC or DC operated. Brake wheels shall be heavy duty cast iron or ductile iron.
2. Bridge brakes are to be of the short stroke, shoe or disc type, electrically operated, spring set design rated 100% of the torque rating of the motor.
3. Each hoist shall be equipped with electrically operated, spring set design rated 150% of the torque rating of the motor.
4. Trolley brakes are to be shoe or disc type rated 50% of the torque rating of the motor.
G. Limit Switches
1. Hoists shall be equipped with an "upper" and "lower" screw type limit switch. This switch shall be the control type. The "lower" screw limit switch shall operate with not less than two complete turns of rope remaining on the drum. The "upper" screw limit switch shall be positioned to activate before the control circuit limit switch.
2. In addition to the screw type, hoists shall be equipped with an upper motor line circuit limit switch to positively interrupt the control circuit to the motor. This limit switch shall be of the load block type with positive captive cable provisions. This limit switch shall be of the quick make, quick break design and be equipped with a minimum of two normally closed power contacts.

H. Crane Electrical Controls
1. Hoist electrical controls (main and auxiliary) shall be Electromotive Complete Panel, Model VG+ Flux Vector type, PEI, or approved substitute, adjustable frequency drive for hoist control. This control must be able to electrically suspend full capacity load at zero speed. System to include the Flux Vector type adjustable frequency drive, line shaft encoder, heavy duty dynamic braking resistor (-XX type), external dynamic braking transistor, control voltage interface card, brake contactor, mounted and wired in a NEMA 12 enclosure. Load float and express speed features are to be included.
2. Bridge electrical control shall be Electromotive Complete Panel Model G+, PEI, or approved substitute, adjustable frequency drive for travel controls. Panel to include the adjustable frequency drive, heavy duty dynamic braking resistors (-X type), external dynamic braking transistor, control voltage interface card, brake contactor, mounted and wired in a NEMA 12 enclosure.
3. Trolley electrical controls shall be Electromotive Company Panel Model G+ PEI, or approved substitute, adjustable drive for travel controls. Panel to include the adjustable frequency drive, heavy duty dynamic braking resistors (-X type), control voltage interface card, brake contactor, mounted and wired in a NEMA 12 enclosure.
4. Provide non-breakable continuous duty resistors. Resistors shall be mounted in a guarded location with a screen guard to prevent body contact.
5. The remote radio control for the crane shall be:
   a. 5-Step Radio Control.
   b. Nicad battery.
   c. Rotary switches shall be metal.
   d. The radio control shall be 100% compatible with the Electromotive Drive System and support reverse plugging simulation.
   e. Radio control must support three motions
   f. Radio control must be label directions of horizontal motion using north, south, east, west; unless otherwise directed
   g. Manufacturers:
      1) Electromotive
      2) Telemotive
      3) Approved substitute
6. Provide back-up control pendent.

I. Safety Devices
1. A high-interrupting capacity manual-magnetic safety disconnect switch shall be provided at a convenient location on the crane near the main collectors. The interrupting capacity of this disconnecting device shall be not less than locked rotor current of the largest motor plus the full load current of the other connected operating equipment. Necessary
motor branch-circuit protection shall be provided for wires feeding the hoist, trolley and bridge control panels.

2. A flashing red warning light to be automatically activated by crane control power "ON".

3. Siren (wail type) to sound when activated by a button on the radio transmitter only.

J. Crane Bridge Conductors

1. Supply festooned bridge insulated conductors on a 6" I-beam track or enclosed "C"-track with four wheel trolleys with bumpers; cables to be extra flexible.

K. Runways

1. Runways shall be wide flange or built-up plate construction. Any required web plates shall fit accurately under the top flange/cover plates.
   a. Maximum deflection under full load shall not exceed L/600.

2. Runways shall have double end stops, double angle web connected end stops and single angle flange connected end stops.

L. Runway Conductors And Collectors

1. Runway collectors are to be tandem type rated 100 amp.

2. Four conductor pick-up bars; 3 power and 1 ground.

3. Hoisting rope shall be 6 X 37 IWRC only. Use of metric rope is not allowed. The rated load plus hook block weight divided by the number of parts of rope shall not exceed 20 percent of the nominal breaking strength of the rope. Provide guards between the girders to prevent the hoisting ropes from contacting main line conductors.

M. Lubrication

1. Bearings shall be provided with proper lubrication or means of lubrication through grease fittings.

2. Contractor shall provide for proper lubrication of bearings and gear boxes prior to the start-up or testing of equipment.

N. Painting

1. Paint System
   a. Clean surfaced per SSPC-SP-3.
   b. Apply one prime coat of rust inhibiting primer and one finish coat.
   c. Paint Color Code: NPVP 3.75YR 6/14; Safety Orange

2. Crane capacity to be shown in U.S. tons.

3. Crane Service Class Designation (Duty Cycle) to be painted on both sides of the bridge girder.

4. Crane number to be painted on both sides of the bridge for ease of identification by operator.

5. Directional symbols, using north, south, east, west unless otherwise directed; to be painted to bottom of the bridge girder for crane operator orientation.

PART 3 - EXECUTION

3.1 MISCELLANEOUS

A. Conditions of appendices must be adhered to.
B. The Vendor is responsible for the field verification of stated conditions and dimensions.

3.2 CRANE SCHEDULE

A. Crane Bridge 1
1. Quantity: One
2. Type: Double girder, top running.
3. Service: Indoor Class "C" service
5. Capacity - Lifts – Span:
   a. Main Hoist: 7½ Tons
   b. Auxiliary Hoist: None
   c. Main Hoist: 15'-0" (10'-0" Minimum Hook Height)
   d. Span: 41'-0".
6. Special Features
   a. Minimum clearance from high point of crane to bottom of obstruction is 3". Make sure that possible obstructions will clear, such as lights, and alike.
   b. Centerline of hook to extreme of crane on drive girder side is 8'-0" or less, minimize.
   c. Centerline of hook to extreme of crane on idler girder side is 8'-0" or less, minimize.
   d. Centerline of hook to centerline of runway rail is 4'-0" or less both sides, minimize.
   e. Hook: "C" hook capable.
7. Materials Handled
   a. Chassis Carts
8. Environment
   a. Ambient Temperature: 65 deg F to 85 deg F
   b. Atmosphere: Relatively clean and indoor
9. Speeds
   a. Main Hoist: 5-16 FPM with express speed at 25% load
   b. Trolley: 22/65 FPM with dynamic braking and reverse plugging
   c. Bridge: Variable, 100 FPM at full load with dynamic braking and reverse plugging
10. Building Clearances
    a. Floor to Top of Runway Rail: 11'-7"
    b. Top of Runway Rail to Low Point of Obstruction: 4'-5"
    c. Bridge Runway Rail Size: As required for crane purchased; new
    d. Bridge Runway Length: 43'-6"

   END OF SECTION