

SPECIFICATION: UNDERHUNG, SINGLE GIRDER BRIDGE CRANE SYSTEM

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1.0 SCOPE

Vendor is to provide a complete ____ ton capacity underhung single girder bridge crane system

2.0 REFERENCE DRAWING

3.0 RESPONSIBILITIES

3.1 Vendor will furnish on this order:

3.1.1 All material necessary for the complete installation of the above mentioned crane.

3.1.2 Complete controls.

3.1.3 Equipment operating instructions.

3.1.4 Drawings and parts lists as specified.

3.1.5 The complete system, including the installation, must conform to the applicable requirements of the latest edition of the following:

- Occupational Safety and Health Act (OSHA)
- State and Local Codes
- American Gear Manufacturers Standards (AGMA)
- American National Standards Institute (ANSI)
 - B30.10 – Hooks
 - B30.11 – Underhung Single Girder Bridge Cranes
 - B30.16 – Overhead Hoists (underhung)
 - HST-1M – Performance Standard for Electric Chain Hoists
 - HST-4M – Performance Standard for Overhead Electric Wire Rope Hoists
- Crane Manufacturers Association of America (CMAA)
 - CMAA Specification #70, for electric underhung cranes
 - CMAA Specification #74, for electric underhung cranes
- Hoist Manufacturers Institute (HMI)
 - HMI 100-74 Specifications for electric wire rope hoists
- National Electric Manufacturing Association, Inc.
- National Electric Code (NFPA 70)
- Motors – NEMA MG-1
- Control Enclosures – NEMA Rated

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3.2 Site contractor will furnish the materials and labor for the following:

- 3.2.1 Complete erection
- 3.2.2 Supporting steel for runway beams
- 3.2.3 Runway beam (See 6.0)
- 3.2.4 Electric power service
- 3.2.5 Painting as required

4.0 OPERATING CONDITIONS

- 4.1 The equipment will be installed _____(type of building) building with a roof, (indoors, outdoors)
- 4.2 The equipment will be operated in ambient temperatures ranging from _____ degrees F to _____ degrees F
- 4.3 The atmospheric conditions are classified as (wet, dry, humid, and hazardous, nonhazardous)
- 4.4 Electrical classification: (Class I & II, Group B, C, D, E, F, G Division 1, 2; safe-nonhazardous)
- 4.5 Electrical power characteristics: Power for operating the equipment will be supplied by a (230v, 460v (nominal), three-phase, 60hertz, delta, wye) connected circuit. For DELTA connected circuits the L2 neutral of this circuit is connected to ground at the distribution transformer. A variation of $\pm 5\%$ from the nominal voltage can be expected at the feeder terminals during normal plant operations. For DELTA systems the B phase is grounded and per the National Electric Code a fuse is not allowed in the B phase.

5.0 GENERAL SPECIFICATIONS

- 5.1 Hook Capacity
 - 5.1.1 Tons _____
- 5.2 Total Lift - _____

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5.3 Operating Speeds

- 5.3.1 Bridge: _____ feet per minute
- 5.3.2 Trolley: _____ feet per minute
- 5.3.3 Hoist: _____ feet per minute

5.4 Type of Control – ac control for pendant operation from the operating floor

- 5.4.1 Bridge: (Single, two speed; VFD: soft start-soft stop)
- 5.4.2 Trolley: (Single, two speed; VFD: soft start-soft stop)
- 5.4.3 Hoist: (Single, two speed; VFD: soft start)
- 5.4.4 Variable Speed Only: (infinitely variable; static stepless)

5.5 Type of Service

- 5.5.1 Crane – CMAA Crane Service Class C, D
- 5.5.2 Hoist – HMI 100-71 Hoist Service Class H3, H4

5.6 Heights

- 5.6.1 Operating floor to hook in high position _____
- 5.6.2 Operating floor to bottom of runway beams _____
- 5.6.3 Operating floor to underside of building structural steel _____
- 5.6.4 Operating floor to underside of crane girder _____
- 5.6.5 Operating floor to high point of crane _____ (minimum 3” below low obstruction)

5.7 Length of runway _____

5.8 Span between centerlines of runway beams _____

5.9 Section size of runway beams _____

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6.0 CRANE RUNWAYS

Crane runway tracks shall be furnished by the (crane vendor, steel contractor) and shall be fabricated of (narrow flange patented beam, s-beam, w-beam sections). The lower section shall provide a smooth rolling surface. Runways shall be hung from the building steel on the column centerlines. Additional supporting steel will be provided where required, as specified by the steel design engineer. All connections shall be (bolted, hole-less, flush plate mounted). The (crane vendor, steel contractor) shall supply all accessories required for completing the installation. Stops shall be provided at the extreme of crane travel.

7.0 BRIDGE

- 7.1 The bridge shall consist of one precision rolled, (patented track s-beam, w-beam section). Section shall be rigidly braced, and securely fastened to the end trucks to maintain proper alignment.
- 7.2 The end trucks shall consist of (tube, structural sections) bolted to the bridge beam. A long wheelbase shall be provided for proper weight distribution. Each carrier shall be furnished with four hardened tread wheels equipped with antifriction bearings. Minimum ratio of 8:1, crane span: wheel base.
- 7.3 The bridge shall be motor-driven through gear reducer and shaft, using (2) gear reducers, known as A-4 drives. The drives shall be shock-free on starting and stopping. Safety lugs and bridge motor disk brakes shall be furnished on each carrier end truck.

8.0 TROLLEY

- 8.1 A monorail type carrier shall be furnished to support the hoisting equipment and operate on the bridge girder. Hardened tread wheels with antifriction bearings shall be provided.
- 8.2 The carrier shall be motor driven by a (worm gear drive, spur gear drive) unit. An electric brake shall be furnished on each drive. The drive shall be shock-free on starting and stopping. Safety lugs shall be furnished on the trolley.
- 8.3 The carrier shall be of welded steel construction. It shall be designed to transmit the imposed load to the bridge girder without undue deflection.

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9.0 HOIST (Choose 1 Type)

(ELECTRIC WIRE ROPE HOIST)

- 9.1 A hoisting machine of proper capacity shall be mounted on the trolley. It shall consist of a motor, gear reducer, hoist drum, sheaves, load block, hook and hoisting rope. An electric brake and mechanical load brake or high ratio worm drive shall be supplied on the hoist.
- 9.2 The motor shall be designed specifically for hoisting duty. The electric brake shall be of suitable size to promptly stop the motor rotation in either direction and hold the load.
- 9.3 The mechanical load brake shall be a (Weston friction disc type, high ratio worm gear set w/ minimum ratio 60:1) and be capable of holding and controlling the lowering speed of the load under all conditions.
- 9.4 Precision cut, full depth teeth, (heat treated forged steel gears, centrifugally cast alloy bronze gear and heat treated worm) shall be used in the gear reducer. These gears shall be provided with oil bath lubrication and enclosed in a drip-proof case.
- 9.5 The hoist drum and sheaves shall be of large diameter to permit maximum rope life. The drum diameter shall be at least 20 times the rope diameter and shall be grooved to provide for the entire lift without overlapping the rope. With the hook in its lowest position, at least two turns shall remain on the drum. The drum flanges shall be guarded so that the rope cannot wedge between the drum and the hoist frame.
- 9.6 A paddle or weight operated type upper final limit switch shall be provided to protect against hoisting beyond safe limits of travel. The switch system must be designed in such a manner that the switch operator mechanism cannot be overtraveled and allow the switch to become inoperative.
- 9.7 A loading limit device shall be provided to prevent overstressing the system. This device shall reenergize the hoist motor and immobilize the up-circuit when an overcapacity lift is attempted. This switch must be set to overcome dynamic loading conditions but not exceed 125% rated capacity.

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- 9.8 Geared upper and lower limit switches shall be furnished to restrict motion beyond the normal operating travel. These switch contacts shall be connected in the respective motor control circuits.
- 9.9 The hoisting rope shall be improved plow steel, of suitable diameter, with a factor of safety of at least five. Connection to the drum shall be made adequately and shall be easily detachable for replacement.
- 9.10 The load block shall be of the enclosed type and equipped with a swivel type safety latch hook.

(ELECTRIC CHAIN HOIST)

- 9.11 The hoisting machine shall be electric and of the proper capacity. It shall be mounted on an integral trolley and shall consist of gear reducers, zinc plated load chain and hook; motor and mechanical load brake shall be supplied.
- 9.12 The hoist motor shall be designed specifically for hoisting duty. The motor brake shall be of suitable size to promptly stop motor rotation in either direction and hold the load. The mechanical load brake shall be the friction disc type and be capable of holding and controlling the lowering speed of the load under all conditions.
- 9.13 Precision cut, full depth teeth, heat-treated, forged steel gears shall be used on the gear reducers. These gears shall be provided with oil bath lubrication and enclosed in a drip-proof case.
- 9.14 Upper and lower hook travel limiting devices shall be provided.
- 9.15 A latch hook is to be provided.
- 9.16 The hoist must have a load limiting device to prevent overstressing the system. This device must prevent overcapacity lift, exceeding 175% of rated capacity.
- 9.17 A chain container must be provided on each hoist.

10.0 MOTORS

All motors shall be rated for either hoist, trolley or bridge duty, totally enclosed, induction type, per NEMA MG-1. They shall be (230, 460) volts, three-phase, and rated for 30 minute operation, Class "F" insulation under full load with a temperature rise not to exceed 80°C above an ambient temperature of 40°C. Service factor=1.0.

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Motors shall be the standard type supplied by the hoist, trolley and crane component manufacturer.

11.0 CONTROL STATION

11.1 A pendant type pushbutton station shall be provided to control the motions of the bridge, trolley, and hoist. This station shall consist of buttons having the following marking:

- | | |
|-------------------|--------------------|
| • Bridge Forward | Marked North, East |
| • Bridge Reverse | Marked South, West |
| • Trolley Forward | Marked East, North |
| • Trolley Reverse | Marked West, South |
| • Hoist Up | Marked "Up" |
| • Hoist Down | Marked "Down" |
| • Start | Marked "Start" |
| • Stop* | Marked "Stop" |

*Button to have red mushroom head

Where two speed control is specified, fast/slow buttons shall be incorporated into the above arrangement.

11.2 The pushbutton station shall be suspended on a bonded strain cable, from a festooned track mounted on the bridge, to a position 4'-0" above the operating floor level from the bottom of the station. It shall be possible to move the station along the bridge span independent of the trolley.

11.3 The pushbutton enclosure shall be of lightweight construction in accordance with Vendor's standard.

11.4 The pushbutton station shall consist of lightweight enclosure and a cover with button guards.

12.0 TRAVEL LIMIT SWITCHES

Limit switches shall be provided on the bridge and trolley and wired into the respective control circuits to stop the driving motors at the extremes of travel. Triggers shall be provided by the crane manufacturer.

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13.0 CURRENT CONDUCTORS (Choose 1 Type)

(CONDUCTOR BAR)

- 13.1 A four-bar, enclosed type conductor system, Duct-O-Bar, Conductix or approved equal, shall be provided along the full length of the runway (_____ ft. long). Three of these conductors will be used to supply electric power to the crane. The remaining conductor, colored green, will be used for equipment grounding.

(FESTOONED)

- 13.2 A four-conductor, flat, neoprene insulated, festooned flexible cable shall be provided along the runway (_____ ' long) to supply electric power to the crane. Three of these conductors will be used to supply electric power to the crane. The remaining conductor will be used for equipment grounding. The cable shall be connected to junction box at one end of the runway. A similar system shall be provided on the bridge span (_____ ') for power, control and equipment grounding.

(CABLE REEL)

- 13.3 A spring-loaded cable reel complete with four conductor cables shall be provided on the crane bridge to supply power and equipment ground to the equipment. The cable shall be arranged to pay out from a terminal point at the end or midpoint of the runway (_____ ' long). A cable reel mounted at runway midpoint will require a pivot base.

14.0 CRANE CONTROL

- 14.1 Speed control shall be provided for all travel and hoisting motions as outlined in Paragraph 5.4 of these specifications.

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(SINGLE AND TWO-SPEED ONLY)

14.2 All single or two speed motions shall be controlled by across-the-line, reversing type motor starters, with an electronic trolley and bridge soft start.

(VARIABLE SPEED)

- 14.3 Variable speed motions shall be controlled by a variable frequency drive, as specifically provided for bridge crane systems by either Power Electronics or Magnetek, with programmable speeds, acceleration and deceleration. (Do not substitute a non-crane/hoist VFD.)
- 14.4 The control circuit voltage shall not exceed 120 volts. This voltage shall be supplied from a dry type transformer of proper capacity. The primary leads of this transformer shall be connected across the "L1" and "L2" lines of power service. The X2 line on the transformer secondary shall be grounded and adequate fuse protection supplied in the undergrounded X1 line.
- 14.5 Motor thermal overload protection shall be furnished by "Klixons" embedded in the motor windings.
- 14.6 A main line disconnect switch and magnetic contactor shall be furnished. The latter shall be energized from the pendant pushbutton station. Momentary pressure on the emergency stop pushbutton shall de-energize this contactor.
- 14.7 Branch circuit (fuse) protection shall be furnished for each motor function.

15.0 ELECTRICAL WIRING

- 15.1 The complete electrical installation shall be made in accordance with the National Electric Code requirements and the conditions outlined in Paragraph 4.
- 15.2 All electrical equipment shall be mounted in NEMA Type 3.4.7.9. enclosures.

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- 15.3 All wiring connections within the electrical control enclosures shall be made with 600-volt, 90 C machine tool wire. Wiring connections between control enclosures and other electrical devices shall be made with 600-volt conductors and run in rigid conduit. Flexible metal conduit may be used to devices requiring position adjustment or run less than three feet. All wiring connections to electrical equipment in control enclosures shall be terminated on terminal strips with lugs or spades and properly identified. Open trays or unguarded wire conductors with zip tied wire bundles are not permitted.

(NONHAZARDOUS AREAS ONLY)

- 15.4 Conduits shall be terminated at all enclosures and boxes in drilled holes or knockouts. Conduits one inch and smaller shall be fastened to the enclosure by the use of dished type lock nuts with trailing knife edge. Conduits, ¼ inch and larger, shall be terminated in a threaded hub or an Appleton "HUB" fitting inserted in a drilled hole knockout. Insulated bushings shall be furnished on all conduit terminations. Threaded conduit fitting shall be used for all other connections.

(HAZARDOUS AREAS ONLY)

- 15.5 Conduits shall be terminated at all enclosures and boxes in threaded hub connections. Insulated bushings shall be provided on all conduit terminations. Threaded conduit fittings and couplings shall be used for all other connections. Sealing fittings, filled with approved compound material, shall be installed on all conduit runs connected to spark producing electrical device enclosures.
- 15.6 A grounding system shall be furnished to effectively maintain the enclosures of all electrical equipment such as motors, brakes, starters, pushbutton stations, boxes, etc. at zero potential.
- 15.7 Vendor is to specify, as part of his design, total connected load (kVA) and maximum expected load current (amperes). Also, the vendor is to recommend 480-volt feeder size and fuse size.
- 15.8 All labels and nameplates must be machine produced. Hand written labels are not acceptable.

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(DAMP AND HUMID ATMOSPHERES)

15.9 Electric space heaters shall be supplied in all enclosures containing main control devices. A minimum of four watts per square foot of enclosure surface shall be provided. Heaters shall have a minimum rating of 240 volts and operate on 120-volt circuit.

15.10 Drain/Breathers shall be supplied in motors and control enclosures.

16.0 EQUIPMENT DESIGN

16.1 All equipment furnished to vendor's standard design, which incorporates weldments, is to be welded in accordance with the appropriate codes and standards of the American Welding Society, D14.1.

17.0 INFORMATION AND APPROVED VENDOR

17.1 Outline drawing indicating required clearances, end approaches, horsepower, and full load current rating of all motors and wheel loadings.

17.2 Manufacturer's name and catalog number of any equipment to be furnished not manufactured by vendor.

17.3 Any exception or difference of any equipment to be furnished from that specified and reason for the substitution.

17.4 Crane vendor shall be an approved certified small business enterprise in the state of _____.

17.5 Approved Crane Builder:
Sveda Cranes, Clarksburg, NJ 08510
1-800-64-CRANE, www.SBOMH.com

18.0 PAINTING

18.1 All surfaces of the structural parts of the crane shall be finished in accordance with the environment and vendor's standard practice for that environment.

18.2 All surfaces of electrical and mechanical parts shall be finished in accordance with the vendor's standard practice.

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19.0 INSPECTION AND TESTS

- 19.1 Inspection by an outside inspector during fabrication shall be permitted by the vendor. These inspections shall be performed to determine the general adherence to these specifications and, in particular, to determine the quality of welding and painting provided.
- 19.2 Final acceptance will be made after the entire installation has been completed and a satisfactory trial has been made. All tests required to prove the ability of the crane shall be made by contractor. A vendor's representative is invited to attend.

20.0 WARRANTY

The vendor shall warranty that the materials and workmanship of the equipment installed under these specifications shall be first class in every respect and shall guarantee the equipment for a period of one year after installation against defective material and/or workmanship, ordinary wear and tear excepted.

21.0 GENERAL

Any other requirements not set forth in these specifications, but necessary for the safe and reliable operation of the equipment, shall be included.