

# Single Girder Under Running Overhead Crane System With Low Headroom Hoist

## Part 1 - General

### 1.01 Work Included

- A. Furnish all labor and material for furnishing and installation of the overhead crane system and all required appurtenances for the \_\_\_\_\_ as indicated on the Drawings, as herein specified and as necessary for the proper and complete performance of this work.
- B. Sequencing of installation with other work shall be done by the Contractor.

### 1.02 System Description

- A. This section includes furnishing the following:
  - 1. One \_\_\_\_\_ ton capacity, \_\_\_\_\_' - \_\_\_\_\_" span underhung, single girder, individual drive crane bridge with a travel speed of \_\_\_\_\_ fpm (1-speed, 2-speed, variable speed) bridge traverse control. Crane to be designed and built per the standards of the Crane Manufacturer's Association of America (CMAA).
  - 2. One \_\_\_\_\_ ton capacity wire rope hoist, \_\_\_\_\_ feet of lift, \_\_\_\_\_ fpm hoist speed, (1-speed, 2-speed, variable speed \_\_\_\_\_).
  - 3. Runway track for a \_\_\_\_\_ foot bay length. Runway track supported on \_\_\_\_\_' \_\_\_\_\_" centers by bolting, welding directly to the \_\_\_\_\_.
  - 4. Runway electrification to be enclosed and supported from brackets mounted to runway track.
- B. The crane is to be installed in the \_\_\_\_\_.

### 1.03 Submittals

#### A. General

- 1. In accordance with the procedures and requirements set forth in Section \_\_\_\_\_, Project Submittal Requirements, the Contractor shall obtain from the equipment manufacturer and submit the following:
  - a. Product Data
  - b. Operation and Maintenance Manuals
  - c. Manufacturer's Instructions
  - d. List of Manufacturers and Model Numbers
  - e. Spare Parts List
  - f. Special Tools List
  - g. Reports of Certified Shop Tests
  - h. Performance Warranty
  - i. List of requested exceptions to the Contract Drawings
- 2. Each submittal shall be identified by the applicable Equipment Identification Number and Section, as detailed in Section \_\_\_\_\_, Project Submittal Requirements.

#### B. Shop Drawings

- 1. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
- 2. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmission.
- 3. Shop drawings shall include but not be limited to:
  - a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.
  - b. Complete assembly, layout and installation drawings with clearly marked dimensions.
  - c. Installation and start-up instructions.
  - d. Weights of all component parts, assembled weight of units and approximate total shipping weight.
  - e. Example equipment nameplate data sheet.

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- f. Interconnecting ladder-type wiring diagrams for power and control wiring required for final connections. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.
- g. List of recommended spare parts.

## C. Operations and Maintenance Manuals

- 1. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in Section \_\_\_\_\_, Operating and Maintenance Manual.

## D. Tools, Supplies and Spare Parts

- 1. Furnish all special tools necessary to disassemble, service, repair and adjust the equipment.
- 2. Spare parts shall be furnished as recommended by the equipment manufacturers.
- 3. See Section \_\_\_\_\_, Spare Parts, Maintenance Items and Tools.
- 4. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. A separate number shall identify each part.
- 5. Spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time the spare parts, supplies and special tools shall be delivered to the Owner as directed by the Engineer. See Section \_\_\_\_\_, Spare Parts, Maintenance Items and Tools.

## 1.04 Quality Assurance

- A. All equipment and appurtenances furnished under this section shall be equal to the named products and shall conform to the applicable requirements of the following:
  - 1. CMAA No. 74 - Crane Manufacturers Association of America
  - 2. ASME HST-4M-1996 - Performance Standard for Overhead Electric Wire Rope Hoists
  - 3. NEMA - National Electrical Manufacturers Association
  - 4. NEC - National Electrical Code
- B. All structural steel members of the handling system shall be designed in accordance with the specifications of the American Institute of Steel Construction, current edition and any welded construction shall be in accordance with the standard of the American Welding Society.

## 1.05 Services of Manufacturer's Representative

- A. The Contractor shall furnish qualified technical representatives from the manufacturer(s) supplying equipment under this specification. Manufacturer(s) services shall be in conformance with Section \_\_\_\_\_, Quality Control and Section \_\_\_\_\_, Material and Equipment and shall also include:
  - 1. Furnishing the services of a technical representative for \_\_\_\_\_ hour days during the installation phase of the equipment. The factory representative shall have full knowledge and experience in the installation of the type of equipment being installed. If more time is required because of Contractor's activities or problems with equipment, additional time is at Contractor's expense.
  - 2. Furnishing the services of a technical representative for \_\_\_\_\_ hour days who has complete knowledge of the operational and maintenance requirements of the system. The factory representative shall instruct the Owner's personnel in the proper operation of the equipment. If more time is required because of Contractor's activities or problems with equipment, additional time is at Contractor's expense.

## 1.06 Lubricants

- A. The manufacturer shall submit a list with a minimum of four manufacturers standard lubricants, which may be used interchangeably for each type of lubricant required in Section \_\_\_\_\_, Operating and Maintenance Manual.

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## 1.07 Transportation, Delivery, Handling, Storage and Protection

- A. Transportation, delivery, handling, storage and protection shall be in accordance with the requirements of Section \_\_\_\_\_, Material and Equipment.

## Part 2 - Products

### 2.01 Design Stresses

- A. Materials shall be properly selected for the stresses to which they will be subjected. Load carrying parts, except girders shall be designed so that the calculated static stress in the material, based on rated load, shall not exceed 20 percent of the published average ultimate strength of the material. This limitation of stress provides a margin of strength to allow for variations in the properties of materials and under no condition should imply authorization or protection for user to load the crane beyond capacity. Girders shall be designed in accordance with CMAA Specifications.

### 2.02 Equipment and Materials

- A. Furnish and install \_\_\_\_\_ ( ) complete motorized under running \_\_\_\_\_ ( ) ton capacity crane system at the \_\_\_\_\_, together with beams, supports, hangers and accessories necessary for a complete functional installation.

B. Crane Bridge

1. General

- a. Design calculations for bridge girder stresses shall include all live and dead loads and live and dead load impacts and shall follow the method of calculation as prescribed by the Crane Manufacturer's Association of America (CMAA).
- b. A safety factor of 5:1 shall be applied to the design of all load-bearing parts of the crane bridge, hoist and trolley.
- c. The crane will be assembled and tested at the point of manufacture prior to shipment and disassembled only to the extent required to facilitate shipment and installation.
- d. The rated capacity of the crane shall be the load that the crane is designed to carry as specified by the manufacturer and shown in tons on large capacity plates located on each side of the crane bridge. The crane bridge will be designed and built to handle this rated load plus the weight of the hoist, trolley and all handling accessories such as buckets, magnets, grabs, etc., shall be included as part of the load to be handled.
- e. Materials shall be specified herein and shall be free from all defects and imperfections that may affect the finished product. All parts shall be new and unused.

Structural steel shall be of good commercial quality conforming to ASTM specification A36.

End trucks shall be fabricated from structural steel shapes and plates welded into an integral unit and in-line bored to receive the wheel axles.

Bearings shall be anti-friction ball or roller type, oil splash lubricated or equipped with easily lubrication fittings.

- f. The bridge shall be a single girder, under-running, dual (individual) drive structure comprised of the girder, end trucks, drive units, and control panel and electrification system. The bridge shall be designed and fabricated as a complete integral structure with only such parts removable as required to facilitate the erection and maintenance of equipment.
- g. The bridge girder shall be constructed of standard structural shapes or boxed sections, reinforced and welded as required. Connections between the girder and end trucks can be either welded or bolted after installation and squaring.
- h. The end trucks will have a minimum wheelbase of 1/8 of the crane's span. Each end truck will be carried on four (4) wheels running on anti-friction bearings. Wheels will be of machined steel, hardened to 300 -320 BHN, single flanged compound tread wheels capable of running on either wide flange or S-beam runway beams. The end trucks will be provided with rubber bumpers at each end to engage end stops on the crane runway.

2. Bridge drive

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- a. The crane bridge shall be driven by two drives. One located on and driving one pair of wheels on each end truck. Each drive shall consist of a drive gear reducer, a TENV, crane duty, 30 minute rated motor with class F insulation and means of braking to meet the requirements of OSHA.
3. Bridge control panel
  - a. The bridge motion's control shall be located in a bridge-mounted NEMA4/12 enclosure. The bridge control is to be provided with a mainline contactor controlled from the bridge control station and a door-mounted disconnect that turns off power to the bridge panel and drives and the hoist and trolley panel and drives the before the panel door can be opened.
  - b. The control shall be designed and built per the National Electric Code (NEC) standards with color-coded and match-marked wires. The panel shall also meet the standards of an independent certification agency.
4. Crane Motion Control
  - a. All motions of the crane (hoist, trolley and bridge) shall be operated through a single cable suspended pendant pushbutton type control. The pendant shall have two buttons for the control of each motion plus power on/off buttons:
    - (1) Hoist - Up/Down
    - (2) Trolley - Left/Right
    - (3) Bridge - Forward/Reverse
    - (4) Power - On/Off
  - b. The pendant shall be suspended from:
    - (1) The Hoist
    - (2) A fixed point on the bridge
    - (3) From a festoon cable pendant track system running the length of the bridge
  - c. Pushbutton station shall be of molded contour grip type and supported from the hoist by strain relief cable to avoid damage from pull on the control wires. The enclosure is to be NEMA 4X watertight. Controls pendant shall be 115 volt AC, supported by a strain cable. Pendant shall hang to a point 3' - 6" above the operating floor, elevation as shown on the drawings. The pushbuttons shall return to the off position when the operator releases the pressure. The magnetic contactors for all motions shall be mechanically or electrically interlocked. Control voltage at the pushbutton stations shall be grounded to the hoists. A strain reliever cable shall support the control pendant.

**(Optional)** All motions of the crane (hoist, trolley and bridge) shall be operated from a remote radio control transmitter. The radio control system will consist of a hand-held transmitter and a bridge-mounted receiver that interfaces with the hoist, trolley and bridge motion controls. The radio control components are to be NEMA 4/12 enclosed with the transmitter operating off a disposal 9-volt battery. The radio control transmitter shall have two buttons for the control of each motion plus power on/off buttons:
    - (1) Hoist - Up/Down
    - (2) Trolley - Left/Right
    - (3) Bridge - Forward/Reverse
    - (4) Power - On/Off
5. Crane Bridge Electrification
  - a. Power and control voltage will be provided to the moving trolley and hoist through means of a festoon flat cable system. There will be separate cables for the motor power supply (line voltage) and control and these cables will be provided with separate connecting fittings and plugs. The cable connecting fittings and plugs shall be metal, not plastic, and will be of the type easily repairable or modified in the field without special tools. The power and control cables will be carried from trolleys with four (4) steel wheels running in a track suspended off of the bridge girder running the full length of the crane span.
  - b. The bridge will be provided with a main power pick-up (collector pole) and sliding shoe collectors that will contact and run in the shielded bar runway conductor system.
6. Crane Runway System

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## a. Runway Beams

Runway beams will be provided as per the attached drawings supported from hangers (bolted, welded) to the roof trusses as shown on the drawings. The beams will be capped or uncapped as required to achieve maximum hook lift and to handle the crane's loading (Equivalent center loading, E.C.L.) at full capacity load and closest hook approach possible. The ends of the runway beams are to be joined together by means of (welded, bolted) splices.

## b. Runway Electrification

Runway power electrification will be provided running the full length on one side of the runway. The electrification will be of the shielded bar type supported at proper intervals to prevent sag or excessive vibration and with power feeds located to minimize voltage drop so as to provide adequate power to operate at least the hoist and one traverse motion at the extreme ends of the runway.

## C. Electric Wire Rope Hoist

### 1. Trolley and Hoist Specifications

#### a. The electric motor-operated hoist and trolley shall be designed to meet the following operating requirements:

(1) Hoist capacity, tons \_\_\_\_\_

(2) Lift, feet \_\_\_\_\_

(3) Lifting speed, feet per minute \_\_\_\_\_ 2-Speed

(4) Trolley speed, feet per minute \_\_\_\_\_ 1-Speed, 2-Speed, Variable Speed

#### b. Headroom required shall not exceed \_\_\_\_\_ inches from the bottom of the bridge beam to the throat of the load hook.

#### c. Wire rope hoist shall meet the requirements of ASME B30.16 "Overhead Hoists". Hoist shall be heavy duty meeting H4 Service classification as defined in ANSI/ASME HST-4M "Performance Standard for Overhead Electric Wire Rope Hoists". Hoist shall be (SHAW-BOX, YALE) Motor Driven Trolley hoist, model no. \_\_\_\_\_ as manufactured by Lift-Tech International or approved equal. Electric wire rope hoists shall meet the following requirements.

#### d. Frame shall be fabricated from rolled steel to form a one-piece weldment.

#### e. Gear case is to be machined aluminum alloy casting with sealed construction allowing the gears to operate in a bath of oil.

#### f. Bearings shall be high quality anti-friction type of either needle or ball design and used through out the hoist. Bearings, not considered lifetime lubricated by the manufacturer, should be provided with a means for lubrication.

#### g. Brakes: Hoist shall have a DC electrical disc motor brake spring set electrically released, rated at 200% of the hoist motor's torque. The brake shall have the capability of holding rated load in the event of sudden power failure.

#### h. Overload device (optional) shall be provided to prevent lifting excessive overloads. This load-limiting device shall be preset at the factory to disengage the hoist motor from the gearing in event of excessive overload condition exceeding 125% of rated capacity.

#### i. Motors shall be of high starting torque type designed specifically for hoist duty service with permanently lubricated ball bearings, rated for 30-minute duty cycle. The motor enclosure is to be totally enclosed non-ventilated, TENV fan cooled. Motor insulation shall be class F Minimum. The 2-speed motor shall have a high speed to low speed ratio of 6:1 for higher production speed and lower speeds for positioning. Motor is to have automatic reset temperature actuated switch (TAS) in motor windings to provide motor running over current protection.

#### j. Gearing shall be a combination of spur and/or helical, precision cut and heat treated to ensure quiet, efficient operation. Gears shall be totally enclosed and run in a bath of oil to provide maximum lubrication. Gears are either splined or keyed to shafts.

#### k. Hoist rope drum will be grooved to a depth of up to 50% of the rope's diameter and provided with a rope guide. Rope guide will not be used to activate any hoist upper or lower limit switches.

#### l. The diameter of the rope drum shall not be less than 18 times diameter of hoisting cable, the running sheaves not less than 16 times the diameter of the cable. Idler

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sheave diameter shall not be less than 12 times the diameter of the hoisting cable. Hoisting cable shall be 6 x 37 improved plow steel.

- m. Controls shall be centralized, easily accessible in one NEMA 4/12 panel with hinged door. Control circuit voltage to pushbutton station shall not exceed 120 volts.
- n. All control panel wires to be match-marked.
- o. Control panel to be designed and constructed to NEC (National Electric Code) Standards. In addition, the panel will meet the standards of an independent organization.
- p. An upper block operated limit switch shall be included and arranged to stop the hoist motor and apply hoist motor brake when the hook reaches its upper limit. In the event of hook over travel, the motor shall be automatically plugged until stopped and reversed for a slight downward motion of the hook until it comes to a neutral position. A geared upper and lower limit switch shall also be provided that allows the upper and lower limits to be set to accommodate the application.
- q. Trolleys are to have heavy section rolled steel side frames. The wheels are steel with heat-treated universal tread. Motor driven trolleys have totally enclosed non-ventilated (TENV) motors with right angle gear reducers. Trolley wheel gears and pinions have machined cut gear teeth. Spacer washers are provided for trolley adjustments to various beam sizes. Trolley to be driven by two (2) wheels, one on each side.
- r. Trolley shall be adjustable to fit beam flanges from 4 ½" – 14" in width

## 2. Acceptable Manufacturer

Monorail, trolley and hoist shall be Yale, Shaw-Box or approved equal.

## 2.03 Tagging

- A. Provide equipment identification as specified in Section \_\_\_\_\_, Process Equipment and Piping Identification.

## 2.04 Acceptable Manufacturer

- A. The underhung crane unit shall be a CraneMart Dealer/Crane Builder using a Yale or Shaw-Box Hoist.

## Part 3 - Execution

### 3.01 Contractor's Verification

- A. The Contractor shall verify all field dimensions for the underhung crane to be installed and correct conditions detrimental to the proper and timely completion of work. The Contractor shall not proceed with installation of the crane until unsatisfactory conditions have been corrected.

### 3.02 Painting

- A. Except for touch up, all painting shall be done in the shop. The underhung crane shall be primed and finish coated in accordance with Section \_\_\_\_\_, Painting and Special Coatings. Use System No. 5 for all surfaces. Color for System No. 5 shall match that specified for equipment in Section \_\_\_\_\_, Process Equipment and Piping Identification.

### 3.03 Installation

- A. Comply with Section \_\_\_\_\_, Material and Equipment. The Contractor shall arrange to have the manufacturer or supplier of the equipment furnished under this section furnish the services of competent factory-trained and properly certified personnel to supervise the installation and initial operation. Installation and erection of all assemblies and components shall be in accordance with the details indicated on the approved shop drawings and the printed instructions of the manufacturer.

### 3.04 Use During Construction

- A. Use of system is not permitted during construction.

### 3.05 Testing

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- A. Shop Testing: Shop performance tests shall be conducted as specified in Section \_\_\_\_\_, Material and Equipment. These tests will indicate that the equipment can accommodate the specified loads.
- B. Field Testing: After approved equipment is installed, it shall be given a running test where it shall demonstrate the ability to lift and continuously transport the rated capacity, \_\_\_\_\_ tons, throughout the entire length and width of the \_\_\_\_\_.

## 3.06 Warranties

- A. Warranties shall be provided as specified in Section \_\_\_\_\_, Warranties and Bonds.

## 3.07 Cleaning

- A. Prior to acceptance of the work of this Section, the Contractor will thoroughly clean all installed materials, equipment and related areas as per Section \_\_\_\_\_, Cleaning.