Bid Specifications

Underhung Motor Driven Single Girder and Double Girder Cranes and Runways

TC/AMERICAN

Foreword

Bid Specifications for Patented Track Underhung Motor Driven Single Girder Cranes and Runways

You are invited to use this document as a template for developing a bid specification for a Patented Track Motor Driven Crane and Runway System.

The complete format of this document may not be applicable for all installations because of the wide variety of industrial material handling variables. But it will be a useful tool for developing most motor driven crane bid specifications.

Note: The patented track rail referenced in this text is TC/A Series 325 rail. For systems appropriate for TC/A 200 Series, 400 Series or 450 Series rail, make the appropriate dimension and specification changes. For these rail details, see the TC/American Crane Company Catalog, available at www.tcamerican.com; click on the “Catalog/Brochures” button.

We recommend that you contact a TC/American dealer for consultation. Our nationwide network of dealers stands ready to assist you with the important task of specifying the appropriate equipment for your application.

In addition, the following patented track bid specifications are also available:

- Underhung Hand Propelled Single Girder Cranes and Runways, TC/A-501-a
- Monorail Systems TC/A-502-a

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A Member of the
MMA Monorail Manufacturers’ Association
and
CMAA - Crane Manufacturers’ Association of America

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Terms of this Bid Specification

1.0 Work Included in this Specification

1.1 Furnish all labor, materials and services to design and fabricate the underhung crane system as specified herein and/or as indicated on the drawings and as manufactured by TC/American Crane, Elk River, Minnesota 55330. TC/American Crane products are referenced as the level of quality, design, and equipment configuration desired for the application under consideration.

2.0 Related Work Not Included in this Specification

2.1 The building structure complete, including the structural steel to which the suspended overhead track system and/or steel supports shall be attached.

2.2 Furnish, mount and wire an individual fusible electrical disconnect switch including wiring from disconnect to the conductor bars.

2.3 Installation, load testing and unloading of all materials.

3.0 General Design Criteria:

3.1 CODES AND DEFINITIONS

Definitions of terms used in this specification shall be as used in the Glossary of ANSI MH27.1 as prepared by the Monorail Manufacturers Association (MMA). The latest editions of the following specifications and codes shall be conformed to the extent applicable for the application under consideration:

3.1.1 For all equipment:
NFPA-70 National Electric Code (N.E.C.)

3.1.2 For underhung bridge cranes and monorail systems:
ANSI B30.11 Safety Standard for Monorails and Underhung Cranes
ANSI MH27.1 Specifications for Underhung Cranes and Monorail Systems

3.1.3 For Hoists:
ANSI B30.16 Safety Standard for Over-head Hoists, HMI Standard
(Underhung):
ANSI/ASME HST-4M Performance Standards for Electric Chain Hoists
ANSI/ASME HST-4M Performance Standards for Overhead Electric Wire Rope Hoists

3.1.4 Specifications for Design, Fabrication and Erection of Steel for Buildings of the American Institute of Steel Construction (AISC)

3.1.5 American Welding Society (AWS) D14.1 Specifications for Welding Industrial and Mill Cranes and D1.1 Code for Welding in Building Construction

3.1.6 Occupational Safety & Health Act (OSHA)

3.2 MATERIALS

All materials shall be new, and the completed overhead handling system shall be essentially the product of one crane manufacturer regularly engaged in the production of such equipment.

3.3 SERVICE CLASS

All equipment shall be designed for minimum "Class C" (Moderate Service) as specified in the ANSI MH27.1 Specifications, and operation in normal ambient temperatures (0° to 40° C) and normal indoor conditions, free from excessive dust, moisture and corrosive fumes.

3.4 VERTICAL IMPACT

Where powered hoists are used, an impact allowance shall be included in design calculations for carriers (trolleys), cranes, and runway monorail tracks. The impact allowance shall be 1/2% of the rated load for each foot per minute (1.6% of the rated load for each meter per minute) of hoisting speed with a minimum allowance of 15% and a maximum of 50%. For bucket and magnet applications, the impact allowance shall be a minimum of 50% of the rated load.

4.0 Specific Design Criteria

4.1 TRACK & FITTINGS

4.1.1 The track shall be a specially fabricated section with a special rolled bottom section having a raised flat tread with a minimum bottom flange width of 3¼". Bottom flange shall have a minimum ultimate tensile strength of 125,000 p.s.i with a minimum Brinell hardness of 225. Track shall be straight, with factory prepared ends. No rough-cut ends will be permitted. Holes shall be factory punched or drilled.

4.1.2 The track size shall be computed based on the load positioned on the track system to produce the most severe conditions of stress and deflection.

4.1.3 The total track deflection shall not exceed 1/450 of the span or 1¼", whichever is the least.

4.1.4 Track end stops shall be of the bolted type and shall be capable of withstanding the impact of a fully loaded crane or carrier traveling at 50% of the full load speed.

4.1.5 Standard structural shapes or modifications of structural shapes will not be accepted as meeting the requirements of Paragraph 4.1.1.

4.1.6 Track sections shall be installed with bolted type splice plates to provide flush and level connections at the operating tread of the track. No welding will be permitted. The maximum gap between the adjacent ends at load carrying flange shall not exceed 1/16".

4.2 TRACK SUSPENSIONS

4.2.1 All necessary clamps, hanger rods, bolts and other fittings from which the track system is suspended, shall be provided as part of the overhead track system. Track hanger supports shall be spaced as per the drawings attached or as specified.

4.2.2 Means shall be provided on flexible type rod suspensions to allow for minimum 1" vertical adjustment of the track both before and after the system has been put in operation so that the track can be erected and maintained level.

4.2.3 Where flexible type rod suspensions are used, the hanger rod shall be made from high strength steel with rolled or cut threads and furnished with a spherical washer and locking nut at each end. Each nut shall be equipped with a set screw. In addition, a roll pin shall be provided at each end of the rod to prevent the nut from backing off the rod.

4.2.4 Where flexible type rod suspensions are used, the top and bottom hanger fittings shall be provided with a spherical seat to match the spherical washer on the hanger rod.

4.2.5 Where track system is suspended by rod suspensions, the system shall be braced laterally and longitudinally. It is necessary to brace only one track laterally on flexible type rod suspensions. Both tracks shall be braced longitudinally. All bracing is to be provided by the crane erector.

4.2.6 Rigid suspensions can be accomplished by flush clamping or bolting the runway track direct to the support steel.

4.2.7 All suspension fittings shall be furnished with S.A.E. Grade 5 or ASTM A-325 mounting bolts.

4.3 TRACK ELECTRIFICATION

4.3.1 Conductor bar shall be roll formed electro-galvanized steel sections, rated 100 amps continuous. Insulation cover shall be rigid bright red PVC, self-extinguishing, with an operating temperature of 150° F. System shall include a dedicated ground bar.

4.3.2 Conductors are to be complete with mounting clips, end caps, splices with covers and power feeds.

4.3.3 Current collectors shall be the sliding shoe type, spring loaded and so designed that sparking and loss of contact will be minimized.

4.3.4 Separate conductors shall be provided for each phase. More than one conductor in a single enclosure will not be permitted.

4.4 INTERLOCKS (if applicable)

4.4.1 The interlock mechanisms shall be manually operated, tapered latch pin and socket type so designed that they will not operate until the crane is in proper alignment with the connecting crossover or spur rail. When the crane is disengaged from the crossover or spur rail, trolley stops are in the down or closed position. Trolley stops shall not rely upon gravity alone to return them to the down or closed position after unlatching.

4.4.2 A crane travel lockout limit switch shall be provided preventing bridge travel motion while in the "latched" position with the crossover or spur rail.

4.4.3 Runway deflection must be considered at the interlocking points. That portion of the runway which supports the crossover support bracket or the gooseneck spur support bracket shall be limited to 1/1000th deflection, except where spur or crossover point is kept within one-quarter of the distance between runway supports, then deflection is limited to 1/450 of span up to 46 ft., with 1¼" maximum at 46 ft. or over.

4.4.4 The interlock design shall provide for a maximum gap spacing of 1/4" between the adjacent ends of the load carrying flange of the fixed spur or crossover.

4.4.5 Crane, spur and/or crossover electrification can be web mounted or bottom entry type. Conductor bar ends shall be provided with flared guides at the transfer point. Electrification shall be in accordance with Paragraph 4.3.

4.4.6 Interlocking cranes shall incorporate mechanisms as described in Paragraph 4.4.1 and the operation of same shall be by means of pull ropes suspended from crane end truck at the interlocking end of bridge.

4.5 TROLLEYS

4.5.1 Crane end truck trolley assemblies shall be articulating type, such that, the articulated connection shall permit rotational movement in all three axes. Load bars shall be cradled in yokes in such a manner to assure that all wheels are in contact with the operating flange at all times.

4.5.2 Yokes shall be ductile castings, forgings, or steel fabrications and shall be fixture machined.

4.5.3 Design shall be such to facilitate easy installation or removal of wheels at any point along the track system without removing the carrier assembly from the track.

4.5.4 Trolley wheels shall be made from high strength forged or machined steel, 5" minimum tread diameter. The wheel tread shall be accurately machined to assure concentricity of axle and tread, and hardened to 425 Brinell. Wheels are to be furnished with electro-plate finish, black oxide, or equal treatment, in lieu of paint.

4.5.5 Wheel bearings shall be double row precision ball or taper roller bearings, lubricated and sealed at assembly, and fitted with external grease fittings. Bearings must have a minimum B-10 life of 5,000 hours.

4.5.6 Flangeless wheels with side guide rollers may be provided in lieu of flanged wheels.

4.6 CRANE END TRUCKS

4.6.1 End trucks shall consist of steel weldments bolted direct to the crane bridge member, providing a rigid and square connection. Trolleys shall be as specified in Paragraph 4.5 "Trolleys." The ratio of crane span to wheel base shall be a minimum of 10 to 1.

4.6.2 Restraining lugs shall be provided to limit drop of end truck to not more than 1" in the event of wheel, yoke, axle or load bar failures. Restraining lugs shall be placed on both sides of the rail so that if failure occurs, the rail is centrally loaded about the vertical axis.

4.7 SINGLE OR DOUBLE GIRDER CRANES
(as applicable)

4.7.1 Crane girders shall comply with Paragraph 4.1 "Track & Fittings" and shall be equipped with suitable track end stops as outlined in Paragraph 4.1.4.

4.7.2 End truck assemblies shall comply with Paragraph 4.6.

4.7.3 On double-girder cranes, means shall be provided to maintain the gauge of the girders.

4.7.4 Travel speeds, electrical characteristics and specific options, such as, type of electrification, brakes, etc., are to be as noted in the "Specific Job Requirements."

4.8 CRANE DRIVES

One of the following types of crane drives may be used on the crane as a means of power to propel the crane. Applicable crane drive system to be selected on the basis of the "Specific Job Requirements."

4.8.1 Cranes shall be driven by individual motorized trolley drives mounted on two or more end trucks, which provide traction dependent upon wheel loads. Both motorized trolley wheels shall be driven simultaneously through a specially machined drive pinion. Drive wheels shall have hardened treads and employ side guide rollers.

4.8.2 Cranes shall be driven by a squaring shaft drive, which provides traction by pressure of the drive tires on the underside of the track. Bearing pressure of the drive tires on the underside of the runway track shall be adjustable and maintained by spring loaded bearing assemblies. The squaring shaft shall be supported by vertically adjustable anti-friction, self-aligning bearing assemblies.

4.8.3 All motors shall be squirrel cage type, totally enclosed. Motors shall be provided with lifetime lubricated anti-friction bearings, unless otherwise specified.

4.9 CROSSBRIDGE ELECTRIFICATION

One of the following types of electrical power systems may be employed as a means of supplying power and control for hoist and crane travel motions. Applicable electrical power system is to be selected on the basis of the "Specific Job Requirements."

4.9.1 Festooned system consisting of multi-conductor flat cables suspended from trolleys operating on a rigid trolley track mounted parallel to the bridge girder. Trolleys are to be equipped with cable saddles and clamps. The ends of each wire are to be prepared and tagged for field connection to the hoist carrier or motor driven tractor and shall include a flat cable connector for adapting to the control panel.

4.9.2 Rigid enclosed conductor bar system may be web mounted or down-turned. Power and control circuits must have individual conductor bars. The bars and collectors shall conform to the description listed in Paragraph 4.3.

4.9.3 Factory mounting and wiring of festooned or rigid enclosed conductor bar systems is required.

4.10 CRANE CONTROLS

Controls for the cranes are to include the following features:

4.10.1 Controls shall be housed in a NEMA 12 enclosure for protection against dust and moisture.

4.10.2 A fused manual disconnect switch, with a lockable thru-door handle, shall be provided and wired into the incoming circuit from the runway power collectors.

4.10.3 A magnetic mainline contactor is to be provided and operated from the pushbutton station.

4.10.4 All motor control components shall be adequately sized for crane duty consistent with horsepower requirements. Motor starters when used shall be of the reversing type, fully magnetic, with mechanical and electrical interlocks.

4.10.5 Each motor shall be provided with thermal overload protection.

4.10.6 Fusing shall be provided on the secondary side of the control circuit transformer.

4.10.7 A means for controlling acceleration must be provided. Across the line starting is not acceptable.

4.10.8 The complete control panel is to be factory mounted and wired. All wires within the panel are to be marked and terminated on coded terminal strips.

4.10.9 All wiring shall be in "EMT" (Electrical Metallic Tubing) conduit wherever possible. Flexible cable may be used on short runs where "EMT" conduit is not practical.

4.11 MOTOR PROPELLED DOUBLE BRIDGE HOIST CARRIER (if applicable)

4.11.1 Basic construction shall be comprised of two end trucks, structural framing, crane drive and electrical controls.

4.11.2 Trolleys and end truck assemblies shall comply with Paragraphs 4.5 and 4.6.

4.11.3 Carrier drives shall comply with Paragraph 4.8.

4.11.4 Carrier electrical controls shall comply with Paragraph 4.10. (Requirements of Paragraphs 4.10.2 and 4.10.3 may be omitted from carrier panel on non-interlocking cranes and some interlocking cranes.)

4.12 HOISTS

Crane supplier shall furnish as part of their contract a hoist of the type most suitable for the particular application under consideration. Such hoist shall comply with the appropriate standard listed in Paragraph 3.1.3. Hoist capacities, speeds and lift shall be as shown on the drawings or as listed in the "Specific Job Requirements."

4.12.1 Hoists and appurtenances shall be designed to withstand all stresses imposed under safe operating conditions while handling loads within the rated capacity. Load bearing parts shall be designed such that the static stress, calculated for rated load, shall not exceed 20% of the ultimate strength of the material.

4.12.2 Hoists are to be furnished complete with a suitable pushbutton control station. Pushbutton arrangement is to be supplied with strain relief protection. Control actuators shall be dead-man type with speed adjustment of multi-speed control obtainable by progressive depression of the pushbutton elements to increase motor lift speed and spring return to off position.

4.12.3 The braking system shall be capable under normal operating conditions with rated load to stop and hold the load when controls are released. Controlled lowering shall be limited to 120% of rated lowering speed. In the event of complete power failure, the load shall be stopped and held.

4.12.4 All bearings shall be heavy duty, anti-friction type with a minimum B10 life of 5,000 hours. Motor bearings shall be lifetime lubricated, sealed ball bearings.

4.12.5 All gearing shall be heat treated alloy steel machined for smooth quiet operation

4.12.6 Bottom block shall be completely shrouded for safety and fabricated from steel. Sheaves must be forged or rolled steel, running on anti-friction bearings. Hooks are to be forged steel supported by anti-friction thrust bearings and permit 360° rotation. Hooks shall be equipped with latches unless the application makes the use of the latch impractical. When required, a latch shall be provided to bridge the opening of the hook for the purpose of retaining slings, chains, etc., under slack conditions.

4.12.7 Motors shall be totally enclosed, specifically designed for hoist service capable of starting and operating under any condition within the designed capacity and provided with thermal overload protection.

4.12.8 Each hoist shall incorporate at least one sensor to limit motion at the top of travel.

4.12.9 Electric hoist controls shall comply with N.E.C. requirements for the application being considered and shall include control circuit fusing and contactors mechanically and electrically interlocked.

5.0 Crane Assembly and Test:

Cranes shall be factory assembled, and a no load running test of controls and drive machinery to ensure proper operation shall be performed. The cranes will be disassembled only as necessary for shipment.

6.0 System Marking:

All major components of the system shall be marked at the factory so as to assure prompt and proper field I dentification.

7.0 Painting

7.1 All material shall be cleaned of loose rust, mill scale and foreign matter.

7.2 Crane bridges, hoists, trolleys, runways and suspension fittings shall be painted one shop coat of manufacturer's standard finish.

7.3 Equipment must be adequately protected against damage and rust in shipment.

8.0 Warranty

Manufacturer shall provide a suitable equipment warranty.

9.0 Manufacturer's Drawings and Data:

9.1 General Arrangement Drawings:
Drawings showing plan, elevation and sectional views along with all other pertinent data shall be provided by the Crane Supplier.

9.2 Panel Layout and Schematic Wiring Diagrams:
Complete wiring diagrams shall be provided, showing all electrical devices, numbered terminal strips and wiring.

10.0 Spare Parts and Maintenance Manuals

Crane Supplier shall furnish two (2) complete sets of replacement parts and maintenance manuals for the equipment after shipment. These manuals are to include key component breakaway pictures for ease of parts ordering, catalog cut pages, part numbers, sub-assembly details, and periodic inspection and maintenance requirements recommendations.

Specific Job Requirements for a Crane System

The foregoing specification is basic and will require additional data in order to develop a detailed specification. This data will ensure that bidders will quote to the specific job requirements.

As an aid to you, following is a list of items, which are to be completed by the specification writer and included with the general specifications.

System Capacity: _____ tons

Material to be handled: _____

Type of Service, Reference ANSI MH27.1 Specification, Section 2, Paragraph 2.2

Specify: _____

Runway:

Overall length of runway is:

_____ Ft. _____ In.

Distance between runway support is:

_____ Ft. _____ In.

Distance from floor to top of runway is:

_____ Ft. _____ In.

Runway Track Suspension:

- ☐ Flexible rod
- ☐ Flush clamp
- ☐ Bolt direct

Note: Many factors enter into the selection of the proper suspension system, i.e., maximum hanger reaction, building configuration, distance from top of runway to bottom of support structure, etc. Therefore, in some cases, assistance from a TC/American dealer may be beneficial.

Crane:

Span: _____ Ft. _____ In.

Overall: _____ Ft. _____ In.

Type:

- ☐ Motor propelled single girder
- ☐ Motor propelled double girder

Travel Speed:

- ☐ Single speed @ _____ f.p.m.
- ☐ Two-speed @ _____ f.p.m.
- ☐ Other _____ f.p.m.

Speed Control:

- ☐ Single speed with solid state reduced torque starting
- ☐ Two-speed with solid state reduced torque starting
- ☐ Variable Frequency
- ☐ Other (specify)

_____

Crane Electrification:

Type:

- ☐ Shielded channel bar conductor
- ☐ Festooned flat cable & trolley track

Pushbutton:

Location:

- ☐ Hoist or tractor
- ☐ Trolley track (traveling pendant)

Hoist Trolley:

Type:

- ☐ Motor Propelled

Travel Speed:

- ☐ Single speed @ _____ f.p.m.
- ☐ Two-speed @ _____ f.p.m.
- ☐ Other _____ f.p.m.

Speed Control:

- ☐ Single speed with solid state reduced torque starting
- ☐ Two-speed with solid state reduced torque starting
- ☐ Other (specify)

_____

Hoist:

Type:

☐ Electric chain

☐ Electric wire rope

Lifting Speed:

☐ Single speed @ _____ f.p.m.

☐ Two-speed @ _____ f.p.m.

☐ Variable Speed @ _____ f.p.m.

Required Lift:

_____ Ft. _____ In.

Building Power Supply:

_____ volts _____ ph _____ Hz

Control Voltage:

_____ volts _____ ph _____ Hz

Building Drawings:

General arrangement and structural drawings should be furnished whenever possible.