

SECTION 41 22 43PRIVATE

FREE STANDING WORK STATION STEEL BRIDGE CRANE

******* Gorbel, Inc. manufactures a broad range of material handling cranes including monorail, bridge, gantry, and jib cranes. Numerous work station and industrial models are provided.**

This guide can be used to prepare a specification for incorporating free standing work station steel bridge cranes into a competitively bid construction project.

The specification section is organized by placing information in three standard parts:

PART 1 - GENERAL

Describes administrative and procedural requirements.

PART 2 - PRODUCTS

Describes materials, products, and accessories to be incorporated into the construction project.

PART 3 - EXECUTION

Describes how the products will be installed at the construction site.

Throughout this product guide specification, references are made to other specification sections that might be contained in the project manual. These references are presented as examples and coordination reminders. For each project, these references will need to be revised to reflect actual sections being used.

Within the specification text, Imperial dimensions are presented first in brackets followed by System International Metric (SI) equivalents also in brackets. Depending on the project requirements, either the Imperial or SI metric equivalents will need to be deleted.

The specifier will need to edit this product specification for a specific project to reflect the options and applications being used. The guide section has been written so that most editing can be accomplished by deleting unnecessary requirements and options. Options are indicated by []. Notes to assist the specifier in selecting options and editing the specification guide are printed in bold and indicated with ***. For final editing, all brackets and notes will need to be deleted from the guide.**

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Free standing, work station, steel bridge crane including floor mounted support structure, runways, movable bridge, hoist trolley, [tractor drive], festooning system, and other accessories.

B. Related sections:

******* List other specification sections related to work of this section such as the following. *******

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1. Section 03 30 00 - Cast-in-Place Concrete: Concrete slab to receive free standing work station bridge crane.

***** Hoist trolley to move lifting device along bridge is provided as part of work station bridge crane. Lifting devices are typically provided separately from cranes and specified in another section. As an option, Gorbel, Inc. can provide lifting device as a crane component. Contact Gorbel, Inc. for assistance in specifying lifting devices. *****

2. Section 41 22 23 - Hoists: [Electric] [Air-powered] [Vacuum] [Manual] lifting device attached to hoist trolley.

***** Hoist trolley and can be equipped with an optional electric tractor drive. Tractor drives can also be installed on end trucks to move bridge. *****

3. Division 26 - Electrical: Electrical supply, conduit, wiring, and other electrical components for powering [lifting device] [hoist trolley tractor drive] [end truck tractor drive].

1.2 REFERENCES

**** List by number and full title reference standards referred to in remainder of the specification section. Delete non-applicable references. ****

A. American Institute of Steel Construction (AISC): Manual of Steel Construction, Part 5, Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

B. American National Standards Institute (ANSI):

1. ANSI B30.11 - Monorails and Underhung Cranes.

C. American Society for Testing and Materials (ASTM) Publications:

1. ASTM A36 - Carbon Structural Steel.

2. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/150 ksi Minimum Tensile Strength.

3. ASTM A490 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

D. American Welding Society (AWS):

1. AWS D1.1 - Structural Welding Code.

E. Occupational Safety and Health Administration (OSHA): OSHA Specification 1910.179 - Overhead and Gantry Cranes.

1.3 PERFORMANCE REQUIREMENTS

A. Crane shall provide coverage of rectangular area of size indicated on Drawings and consist of:

1. Free standing support structure requiring only floor slab support without longitudinal or lateral bracing.

2. Two rigid, parallel runways. Cranes with more than two runways

without longitudinal or lateral bracing.

2. Two rigid, parallel runways. Cranes with more than two runways or with articulating runways are not acceptable.

3. Rigid, single girder bridge moving perpendicular to runways. Double girder bridges and ones with articulating or threaded connections are not acceptable.

B. Modular, pre-engineered design: Crane system shall be capable of expansion, disassembly and relocation, and accepting additional or multiple mixed capacity bridges.

C. Productivity ratio: Crane shall be designed to manually move load with maximum force of 1/100 load weight.

D. Runway and bridge track: Enclosed type limiting dust and dirt collection on rolling surfaces with maximum deflection of 1/450 span based on capacity plus 15 percent for lifting device weight.

E. Crane operating temperature: [5 to 200 degrees F] [-15 to 93 degrees C].

******* Edit the following to reflect project structural design requirements. *******

F. Crane shall be designed to withstand:

1. Crane and hoist dead load.

2. Live load capacity equal to net rated hook load: [[250] [500] [1000] [2000] [4000] pounds] [[113] [227] [453] [907] [1814] kilograms].

3. Inertia forces from crane and load movement.

******* Typically, cranes are designed for normal interior operation. Contact Gorbel, Inc. for assistance in specifying cranes requiring seismic and other additional loads or cranes operating in high humidity or corrosive environments. *******

1.4 SUBMITTALS

A. Provide in accordance with Section 01 33 00 - Submittal Procedures:

1. Product data for crane and accessories. Describe capacities, performance, operation, and applied forces to foundation.

2. Shop drawings showing crane configuration, dimensions, and construction and installation details.

3. Copy of warranty required by Paragraph 1.6 for review by Architect.

4. Manufacturer's installation instructions.

5. Manufacturer's operation and maintenance manual.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in designing and manufacturing cranes with 25 years successful experience.

B. Installer: Company experienced in assembly and installation of cranes.

A. Manufacturer: Company specializing in designing and manufacturing cranes with 25 years successful experience.

B. Installer: Company experienced in assembly and installation of cranes with 5 years successful experience and acceptable to crane manufacturer.

C. Crane shall be designed, fabricated, and installed in accordance with ANSI B30.11, and OSHA 1910.179.

******* Standard impact factor for crane design is 25 percent. Contact Gorbel, Inc. if increased factor is required for high impact applications. *******

D. Base crane structural design includes full rated load capacity plus 15 percent for hoist and trolley weight and 25 percent impact factor for speed of lifting device and weight of tooling.

E. Perform welding by certified operators in accordance with AWS D14.1.

F. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Manual, Part 5.

G. Clearly label crane with rated load capacity. Place label at height and location easily read from floor level and loading position.

1.6 WARRANTY

A. Provide under provisions of Section 01 78 00 - Closeout Submittals:

1. 10 year warranty for crane to cover defects in materials and workmanship.

******* Include the following paragraph if tractor drive for end truck or hoist trolley is being specified. *******

2. 2 years warranty for motorized tractor drive.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Gorbel, Inc., P.O. Box 593, Fishers, New York 14453-0593; 800-828-0086; www.gorbel.com.

B. Requests to use equivalent products of other manufacturers shall be submitted in accordance with Section 01 25 13 - Product Substitution Procedures.

2.2 FREE STANDING WORK STATION STEEL BRIDGE CRANE

******* Refer to Gorbel® pre-engineered crane tables in product literature for complete model number based on capacity, bridge length, runway length, and trolley saddle height. Cranes with other capacities, length, and heights are available using programs at www.gorbel.com or contacting Gorbel, Inc. The following are free standing work station steel cranes manufactured by Gorbel, Inc.:**

GLCS-FS: Cranes with trussed steel runways supported at 20 feet (6.1 meters) maximum.

GLCSL-FS: Cranes with trussed steel runways supported at 20 to 25 feet (6.1 to 7.6 meters) maximum.

GLCSL-FS: Cranes with trussed steel runways supported at 20 to 25 feet (6.1 to 7.6 meters) maximum.

GLCSLX-FS: Cranes with trussed steel runways supported at 25 to 30 feet (7.6 to 9.1 meters) maximum.

Edit the following and complete model number to indicate specific crane and accessories to be specified. *****

A. Type: Work station, all-steel construction, bridge crane with free standing support structure, two runways, bridge moving perpendicular to runways, and equipped with enclosed track, end trucks, hoist trolley, [tractor drive,] festooning system, bumpers, and other accessories; Model No. [GLCS] [GLCSL] [GLCSLX]-FS-[__capacity in pounds__]-[__bridge length__]-[__runway length__]-[__trolley saddle height__] as manufactured by Gorbel, Inc.

******* Refer Gorbel® product literature for standard runway lengths which vary depending on model from 11.5 to 124 feet [3.5 to 37.8 meters]. Longer lengths can be provided to accommodate project conditions by contacting Gorbel, Inc. *******

B. Runway length: [_____] [feet] [meters].

******* Standard bridge lengths range from 10 to 34 feet (3 to 10.4 meters) as indicated below. Contact Gorbel, Inc. if other bridge lengths are required. *******

C. Bridge length: [[10] [15] [20] [23] [28] [34] feet] [[3] [4.6] [6.1] [7] [8.5] [10.4] meters].

******* Standard trolley saddle heights are 10, 12, and 14 feet (3, 3.7, and 4.3 meters). Contract Gorbel, Inc. if other heights are required. *******

D. Trolley saddle height: [10] [12] [14] [_____] [feet] [[3] [3.7] [4.3] [_____] meters].

E. Construction: Fabricate from ASTM A36 steel sections with finished ends and surfaces.

1. Support structure: Support crane runways with frames consisting of two columns and horizontal header.

a. Columns: Square tubes with bottom base plate and top header plate.

b. Header: Fabricated from two back-to-back channels spaced apart and joined with welded end plates. Provide clamp plates, threaded rods, lock washers, and hex nuts for attaching header to column.

c. Hanger assemblies: Provide each support frame with pair of hanger assemblies that provide a rigid connection for suspending runways. Assembly to consist of clamp angle, clamp plates, threaded rods, lock washers, and hex nuts.

******* Include the following paragraph to specify trussed steel runways, Models GLCS (20' maximum support centers), GLCSL (25' maximum support centers), and GLCSLX (30' maximum support centers) *******

2. Runways: Vierendeel truss fabricated from square steel tubes and enclosed steel track.

a. Track: Enclosed cold formed steel box track which serves as bottom

2. Runway: Vierendeel truss fabricated from square steel tubes and enclosed steel track.

- a. Track: Enclosed, cold formed, steel box track which serves as bottom cord of runway and permits end trucks and festoon carriers to ride on lower inside flanges. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.
- b. Splice joint: Provide truss splice plates, channel-shaped track splice joint, bolts, lock washers, and nuts for joining runway sections. Splice joints must be located within four feet of a support point.
- c. Runway Cantilevers: Up to 4 feet of cantilever is allowed from a hanger location to the end of the runway.

******* A short section of enclosed track can be added to runway track for stacking festoon carriers and not limit full coverage of bridge crane. Include the following paragraph for this option. *******

- c. Festoon stack section: Provide enclosed track extension to provide for stacking festoon carriers at end of runway.

******* Typical bridge is a Vierendeel truss using the enclosed track as the bottom truss cord. The ends of the track extend beyond the truss to connect to end trucks on the runways. This provides a higher trolley saddle since the bridge is not completely positioned below the runways. For cranes with low capacity and short bridges, a length of enclosed track can serve as the bridge. Refer to Gorbel® product literature for type of bridge used for specific crane being specified. *******

******* Include the following paragraph to specify trussed steel bridge. *******

- 3. Bridge: Single girder, Vierendeel truss fabricated from rectangular steel tubes and enclosed steel box track.
 - a. Track serves as bottom cord of bridge and permits hoist trolley and festoon carriers to ride on lower inside flanges.
 - b. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.

******* Include the following paragraph to specify enclosed steel track bridge. *******

- 4. Bridge: Enclosed, cold formed steel box track which permits hoist trolleys and festoon carriers to ride along track lower inside flanges. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.

******* Include the following paragraph to specify an aluminum track bridge. *******

- 5. Bridge: Extruded aluminum enclosed track reinforced with extruded aluminum T-beam.
 - a. Provide as either one piece extrusion or with separate T-beam bolted to track.

a. Provide as either one piece extrusion or with separate I-beam bolted to track.

b. Track: Enclosed, box track designed for trolleys and festoon carriers to ride on lower inside flanges. Fabricate lower running flanges with 2 degrees taper to center trolley within track. Flat, non-centering tracks are not acceptable.

6. End trucks: Rigid frame end truck designed to ride inside enclosed runway track and connect to and suspend bridge.

- a. Construction: Stamped steel fabrication with both vertical and horizontal wheels to prevent binding in runway. Designs with welds in tension are not acceptable.
- b. Wheels: Removable, self-centering wheels with sealed lifetime lubricated bearings. Vertical wheels shall be tapered 2 degrees to match track profile. Non-removable or non-tapered wheels are not acceptable. Duracomp 4® wheel material is preferred. Steel wheels are not acceptable.
- c. Drop lugs: Provide on both sides of truck to limit truck drop to [1 inch] [25mm] maximum in event of wheel, axle, or load bar failure.
- d. Connection to the bridge: Provide a rigid connection between bridge and end truck. Articulating connections with threaded hardware are not acceptable.

7. Hoist trolley: Rigid-body trolley designed to ride inside enclosed track of bridge and carry hoist and load. Articulating trolleys are not acceptable.

- a. Construction: Two-piece stamped steel body with two wheels each side and tapered clevis positioning hoist hook at center of trolley so load weight is evenly distributed to all four trolley wheels. Provide removable clevis pin of type and size determined by manufacturer for specified capacity. Trolleys with non-removable clevis pins are not acceptable.
- b. Wheels: Removable, self-centering wheels with sealed lifetime lubricated bearings. Vertical wheels shall be tapered 2 degrees to match track profile. Non-removable or non-tapered wheels are not acceptable. Duracomp 4® wheel material is preferred. Steel wheels are not acceptable.
- c. Drop lugs: Provide on both sides of trolley to limit trolley drop to [1 inch] [25mm] maximum in event of wheel, axle, or load bar failure.

8. End stops: Molded composite, resilient bumper installed in runway and bridge tracks to prevent end trucks, hoist trolley, and festoon carriers from rolling out of track. Bolt stops without energy absorbing bumper are not acceptable.

2.3 TRACTOR DRIVE

**** Hoist trolley and end truck can be motorized using Gorbels® Tractor Drive. Include this article for this option. ****

A. Provide electric tractor drive for motorized operation of [hoist trolley] [and] [end truck]; Tractor Drive as manufactured by Gorbels, Inc.

A. Provide electric tractor drive for motorized operation of [hoist trolley] [and] [end truck]; Tractor Drive as manufactured by Gorbel, Inc.

B. Type: Variable frequency drive assembly with worm gear reducer, molded polyurethane tread, and adjustable counter-balance to ensure proper drive wheel alignment.

******* Standard drive speeds are 70, 90, and 120 feet per minute (21.3, 27.4, and 36.6 meters) per minute. Other speeds are available as options. *******

C. Speed: [[70] [90] [120] feet] [[21.3] [27.4] [36.6] per minute].

D. Motor: 1/3 HP, 1800 RPM, 3 phase, 208-460 volt, with thermal overload protection.

******* Either 120 volt or 24 volt controls can be provided. Control panel is typically field wired to drive motor. As an option, the system can be factory wired. *******

E. Controls: [120] [24] volt control package with transformer, terminal strips, fusing, enclosure, and mounting brackets to be [field] [factory] wired to drive motor.

2.4 ACCESSORIES

******* Several accessories are provided as options for free standing work station bridge cranes. Select required options from the following. Contact Gorbel, Inc. or refer to product literature if other types of accessories are required. *******

******* If motorized tractor drive or electric or air-powdered lifting device is used, a length of cable or hose can be provided for installation on runway and bridge. Include the following to specify hose or cable. *******

A. Provide length of [[flat] [round] electrical cable] [[1/2] [3/8] inch] [[25] [10] mm] diameter air hose] to supply lifting device and festoon along bridge and runway

******* Either festoon trolleys or gliders can be provided to support electrical cable, air hose, or vacuum hose on bridge and runway and allow festooning as hoist trolley and end trucks travel. Electrical and air trolleys are equipped with U-bolt clamps. Vacuum trolleys have straps with velcro. Include the following paragraph to specify festoon trolleys. *******

B. Festoon trolleys: Four-wheeled trolleys with pivoting saddle and [U-bolt clamp] [velcro strap] to support [electrical cable] [air hose] [vacuum hose] on runway or bridge and allowing festooning as end truck or hoist trolley travels.

******* Include the following paragraph to specify festoon gliders. Electrical and air gliders are equipped with clamps. Vacuum gliders have straps with velcro. *******

C. Festoon gliders: [__material__], T-shaped gliders with adjustable [clamp bar] [velcro strap] to support [electrical cable] [air hose] [vacuum hose] on runway or bridge and allowing festooning as end truck or hoist trolley travels.

******* Festoon clamps are required for festooning electrical cable, air hose, or vacuum hose to prevent festoon trolleys and gliders exiting track. *******

D. Festoon clamp: Steel clamp assembly attached to track to prevent festoon [trolleys] [gliders] exiting track.

******* Telescoping bridges and interlock/transfer cranes can also be provided for free standing work station bridge crane systems. Contact Gorbel, Inc. for product information**

******* Telescoping bridges and interlock/transfer cranes can also be provided for free standing work station bridge crane systems. Contact Gorbel, Inc. for product information and assistance in specifying these accessories. *******

2.5 SHOP FINISHING

- A. Steam wash steel crane components with iron phosphate solution and apply baked enamel finish. Colors shall be:
 - 1. Support assemblies and runways: Blue.
 - 2. Bridges: Yellow.
- B. Provide spray cans of matching colors, air-drying paint for field touch-up.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate provision of crane with:

******* Typically, 6 inches (1.52mm) thick reinforced concrete slabs are sufficient for supporting free standing work station bridge cranes. Slabs or other foundations supporting crane must be designed, detailed on drawings, and specified by architect/engineer to accommodate crane, soil bearing pressure, and other project specific conditions. *******

- 1. Design and construction of reinforced concrete [footings] [slabs] as detailed on Drawings and specified in other sections. Ensure that accurate crane applied forces and anchor bolt patterns are provided for foundation design.

******* Include the following paragraph if electric lifting device or motorized tractor drive for hoist trolley is being used. *******

- 2. Provision of electrical supply, conduit, wiring, disconnect switch, and other electrical components for powering electrically operated lifting device [and motorized tractor drive].
- B. Prior to installation:
 - 1. Verify reinforced concrete [foundations] [slabs] have cured 7 days minimum. Ensure that [foundations] [slabs] have cured 28 days minimum prior to using crane to full capacity.
 - 2. Verify type and location of power supply.
 - 3. Inventory parts. Verify all required components are available and undamaged.

3.2 INSTALLATION

- A. Install crane and accessories in accordance with manufacturer's instructions and shop drawings.
- B. Do not modify crane components in any manner without advance,

instructions and shop drawings.

B. Do not modify crane components in any manner without advance, written approval by crane manufacturer.

C. Clearances for moving crane components:

1. [3 inch] [76mm] minimum vertical clearance from any overhead obstruction.
2. [2 inch] [51mm] minimum horizontal clearance from any lateral obstruction.

D. Supporting structure:

1. Layout column locations on floor. Position columns, verify orientation is correct, and use base plates to drill anchor bolt holes. Install anchor bolts with epoxy grout.
2. Anchor columns. Use steel shims or grout to ensure columns are plumb. When plumb, tighten all nuts.
3. Headers: Position header on pair of columns. Attach to column top plate with manufacturer provided hardware. Tighten bolts to manufacturer recommended torque ratings.

E. Runways: Suspend runways under support structure header. Attach with hanger assemblies.

1. Prior to applying proper torque to the bolts, ensure runways are:
 - a. Level to within plus or minus [1/8 inch in 20 feet] [3 mm in 6.1 meters].
 - b. Parallel with opposite runway to within plus or minus 1/8 inch in 20 feet] [3 mm in 6.1 meters].
2. Splices: Use bolts on splice joint assembly to ensure track transition is smooth with no raised areas to inhibit end truck operation.
3. End stops: Bolt stops into runway track on non-festooning end of runways.

******* Only one end truck is firmly clamped to bridge. Other truck floats freely. This compensates for minor misalignment of runways and allows smooth bridge movement. Edit the following paragraph to reflect if end trucks are to be moved with motorized tractor drive. *******

F. End trucks: [Mount bracket and drive to end truck] Slide one end truck onto festooning end of bridge track and clamp firmly into place. Slide other non-clamping truck onto end opposite festooning end (do not clamp this end truck into place).

G. Prior to installing bridge, use clean dry cloth to clean inside flanges of runway and bridge tracks. Bolt end stop in bridge track opposite festooning end.

H. Bridge: Lift bridge with end trucks to runways and insert end trucks into open ends of runways. Roll bridge down length of runway. Verify and adjust for

H. Bridge: Lift bridge with end trucks to runways and insert end trucks into open ends of runways. Roll bridge down length of runway. Verify and adjust for smooth travel.

End stops: Bolt stops into runway track on the festooning end of runways.

******* Include the following paragraph if end truck is to be moved with motorized tractor drive. *******

J. End truck tractor drive: Insert tractor drive into runway track such that tow arm faces end truck drive bracket. Adjust drive counterweight so drive frame hangs level from track. Adjust drive wheel to contact underside of top surface of track. Position end truck up to tractor drive and install self locking pin connecting tow arm to bracket on truck.

******* Edit the following paragraph to reflect if hoist trolley truck is to be moved with motorized tractor drive. *******

K. Hoist trolley: [Mount bracket and drive to the hoist trolley] Attach lifting device to hoist trolley saddle clevis. Secure clevis pin with cotter pin. Roll hoist trolley into open end of bridge track.

******* Include the following paragraph if hoist trolley is to be moved with motorized tractor drive. *******

L. Hoist trolley tractor drive: Insert tractor drive into bridge track such that tow arm faces hoist trolley drive bracket. Adjust drive counterweight so drive frame hangs level from track. Adjust drive wheel to contact underside of top surface of track. Position trolley up to tractor drive and install self locking pin connecting tow arm to bracket on trolley.

******* Include the following paragraph if festoon stack section is required for runway track. *******

I. Festoon stack section: Install section to end of runway track. Use leveling screws to align section and runway track. Position end stop and make welded connection as indicated on shop drawings.

******* Include the following if electric, air, or vacuum festoon system is used. *******

J. Festoon system: Install on runway and bridge.

1. Bolt festoon clamps to enclosed tracks. Slide festoon [trolleys] [gliders] through open end of tracks. Thread [electrical cable] [air hose] [vacuum hose] through festoon [trolleys] [gliders].

2. Equally space [trolleys] [gliders] along track and secure [cable] [hose] with [clamps] [velcro straps].

a. Runway: [72 inch] [1829mm] spacing.

b. Bridge: [36 inch] [914mm] spacing.

******* Include the following paragraph if motorized tractor drives are used. *******

K. Make electrical connections from tractor drive to power source and install controls.

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3.3 FIELD QUALITY CONTROL

A. Move bridge and hoist trolley through entire travel to ensure crane is clear of obstructions and moves freely and smoothly.

B. Inspect installed crane. Verify all bolts are tight and lock washers fully compressed.

C. Field test crane and accessories for operating functions. Ensure crane movement is smooth and proper. [Verify motorized operation and controls function properly.] Adjust as required and correct deficiencies.

D. Clean surfaces. If necessary, touch-up paint damage, scratches, and blemishes with manufacturer provided matching paint.

E. Protect crane from other construction operations.

3.4 DEMONSTRATING AND TRAINING

A. In accordance with Section 01 79 00 – Demonstration and Training, provide demonstration and training session for Owner's representative covering operation and maintenance of free standing work station bridge crane.

END OF SECTION