

**SECTION 41 67 24****FREE STANDING MONORAIL FALL ARREST ANCHOR SYSTEM**

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

This guide can be used to prepare a specification for incorporating Gorbel's Free Standing Monorail Tether Track Fall Arrest Anchor System into a competitively bid construction project. This fall arrest anchor system is designed to protect workers from falls in elevated work environments by providing mobile, rigid anchorage for attachment of an energy-absorbing lanyard or self-retracting lifeline.

The Free Standing Monorail Tether Track Fall Arrest Anchor System includes a trolley that moves along a monorail into position where needed to provide a fall arrest method for elevated workers. The system is free standing and consists of a series of frames constructed of floor anchored columns connected with header beams; monorail beam supported by the frames; and a track on the bottom of the monorail with a wheeled trolley for attachment of fall arrest connector. This fall arrest system has many advantages over a wire rope anchor system such as reduction of fall distance, smooth running surface for trolleys, and the ability to position anchorage above worker reducing swing fall hazard.

Gorbel, Inc. manufactures several other rigid fall arrest anchor systems which can be specified using these Gorbel Product Specifications:

**SECTION 41 67 21 - SWING ARM FALL ARREST ANCHOR SYSTEM**

**SECTION 41 67 22 – FOLD AWAY FALL ARREST ANCHOR SYSTEM**

**SECTION 41 67 23 - FREE STANDING BRIDGE FALL ARREST ANCHOR SYSTEM**

Gorbel, Inc. also provides a rigid rail fall arrest anchor system, Tether Track Rigid Rail Anchor System, which can be used in a custom designed configuration either supported on free-standing posts or attached to an overhead building component. This type of rigid rail fall arrest system can be specified using this Gorbel Product Specification:

**SECTION 41 67 20 - FALL ARREST ANCHOR SYSTEM**

Gorbel Product Specification Guide Sections are 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.

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. \*\*\*\*\*

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**PART 1 - GENERAL**

**1.1 SUMMARY**

\*\*\*\*\* A complete fall arrest system includes an anchor apparatus such as a track and trolley, a body harness, and a connector such as an energy-absorbing lanyard or a self-retracting lifeline (SRL). Gorbel's Tether Track serves as an anchor system for the Free Standing Monorail Tether Track Fall Arrest Anchor System. Fall arrest harnesses and connectors are available from other manufacturers.  
\*\*\*\*\*

- A. Section includes: Free-standing, manually operated, fall arrest anchor system designed to protect workers from falling from elevated work areas. System consists of:
  - 1. Frames: Series of frames constructed of two floor anchored steel columns connected with a steel header beam.
  - 2. Monorail: Steel truss monorail supported by and perpendicular to the frames. Bottom chord of truss is an enclosed channel-shaped track designed to receive tether trolley.

3. Tether trolley: Wheeled trolley inserted into monorail track to provide movable anchor for attaching an energy-absorbing lanyard or a self-retracting lifeline (SRL).

B. Related sections:

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

**\*\*\*\*\* Fall arrest harnesses and connectors for attaching worker in harness to tether trolley are typically provided separately from anchor system. Contact Gorbel, Inc. for assistance in obtaining harnesses and connectors. Include one of the following paragraphs as appropriate for Project. \*\*\*\*\***

1. Section 01 10 00 - Summary: Fall arrest harnesses and connectors provided by [Owner] [others under separate contract to Owner] to be used with anchor system specified in this Section.

**\*\*\*\*\* OR \*\*\*\*\***

2. Section [41 67 19 - Plant Safety Equipment] [\_\_\_\_]: Fall arrest harnesses and connectors to be used with anchor system specified in this Section.

**\*\*\*\*\* For free standing, floor supported, monorail fall arrest anchor system, concrete floors need to be designed by Architect or other Design Professional, specified in other sections, and be provided by other subcontractors. \*\*\*\*\***

3. Section 03 30 00 - Cast-in-Place Concrete: 6 inch reinforced concrete floor slab to receive columns supporting monorail fall arrest anchor system.

## **1.2 REFERENCES**

**\*\*\*\* List by number and full title reference standards referred to in remainder of the specification section. \*\*\*\*\***

- 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 Z359 - Fall Protection Code.
- 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 D14.1 - Welding of Industrial and Mill Cranes and Other Material Handling Equipment.
- E. Occupational Safety and Health Administration (OSHA): OSHA Specification 1926 Subpart M - Fall Protection.

### **1.3 DEFINITIONS**

- A. Person of Authority for Fall Safety: Employee designated by Owner for responsibility for fall safety in work place. Person should be knowledgeable of fall arrest anchor system, potential fall hazards, fall clearance requirements and safety rules and practices as outlined in applicable ANSI and OSHA safety standards.

### **1.4 PERFORMANCE REQUIREMENTS**

**\*\*\*\*\* Edit this article to reflect specific project requirements. \*\*\*\*\***

- A. Free standing monorail fall arrest anchor system in conjunction with connectors and body harnesses provided by others shall protect workers from falling from an elevated work area by minimizing fall distance and maximizing energy absorption while providing for worker mobility to perform tasks.
- B. System shall be interior, floor mounted fall arrest anchor system providing fall protection for single access (or straight line) area indicated on Drawings.
- C. Fall arrest monorail shall support one or more workers weighing up to [310 pounds] [141 kilograms] each with tools.
- D. Installed monorail with track and tether trolley shall be positioned at height indicated on Drawings and shall be straight and level to eliminate potential binding or drift of trolley.
- E. Anchor system shall support full impact of falls vertically and at inclines up to

30 degree offset working angle.

**\*\*\*\*\* In accordance with OSHA requirements, Free Standing Monorail Tether Track Fall Arrest System is designed for a maximum average arresting force (MAAF) of 900 pounds (408 kilograms). As an option, system can be provided for MAAF of 1,800 pounds (816 kilograms). \*\*\*\*\***

- F. System and components shall be rated for [[900] [1,800] pounds] [[408] [816] kilograms] maximum average arresting force (MAAF).
- G. Tether track: Enclosed type limiting dust and dirt collection on rolling surfaces.

## **1.5 SUBMITTALS**

- A. Provide in accordance with Section 01 33 00 - Submittal Procedures:
  - 1. Product data for monorail fall arrest anchor system. Describe materials, components, capacities, performance, and operation.
  - 2. Shop drawings showing system layout, configuration, dimensions, connections, supports, fabrication and installation details. Provide illustrations for warning labels.
  - 3. Design loads: Calculations for loads transmitted from fall arrest anchor system to supporting floor structure.
  - 4. Copy of warranty required by Paragraph 1.7 for review by Architect.
  - 5. Manufacturer's installation and maintenance instructions, Pre-Use Check List, and Inspection and Maintenance Schedule.

## **1.6 QUALITY ASSURANCE**

- A. Manufacturer qualifications: Company specializing in designing and manufacturing fall arrest protection systems and other overhead rail and lifting devices with 25 years successful experience.
- B. Installer: Company experienced in installing fall arrest anchor systems.
- C. Manufacturer and installer shall have specific liability insurance (products and completed operations) in an amount of not less than \$9,000,000.
- D. Manufacturer and Installer Qualifications: Firm specializing in design and fabrication and installation of fall protection systems for structures with

minimum  
15 years' experience.

- E. Fall arrest anchor system shall be designed, fabricated, and installed in accordance with ANSI Z359 and OSHA 1926, Subpart M.
- F. Perform welding by certified operators in accordance with AWS D1.1.
- G. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Manual, Part 5.
- H. Single source: All components of monorail fall arrest anchor system shall be provided by a single manufacturer and shall be specifically approved by manufacturer for installation as part of fall arrest anchor system.

## **1.7 WARRANTY**

- A. Provide under provisions of Section 01 78 00 - Closeout Submittals:
  - 1. 10 year or 20,000 hour use warranty for fall arrest anchor system to cover defects in materials and workmanship.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Gorbel, Inc., P.O. Box 593, Fisher, New York 14453-0593; 800-821-0086; [www.gorbel.com](http://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 FALL ARREST ANCHOR SYSTEM**

**\*\*\*\*\* Gorbel's Free Standing Monorail Tether Track Fall Arrest Anchor System is designed for normal interior operation. Special fall arrest applications such as exterior or motorized systems can be custom designed and fabricated. Contact Gorbel, Inc. for assistance in designing and specifying unique fall arrest anchor systems. Select and edit the following paragraphs to indicate type of fall arrest anchor system required for Project. Refer to Gorbel product literature for available models, spans, weights, dimensions, and transferred loads. \*\*\*\*\***

- A. Type: Free-standing, floor supported, manually operated, fall arrest anchor

system designed to protect workers from falls in an interior, elevated work area. Trolley for anchoring connector travels along monorail beam to desired location where elevated work will be performed and can be retracted out of the way when not in use; Free Standing Monorail Tether Track Fall Arrest Anchor System as manufactured by Gorbel, Inc.

- B. Layout: As indicated and dimensioned on Drawings and reviewed shop drawings.

**\*\*\*\*\* Free Standing Monorail Tether Track Fall Arrest Anchor System is designed to support one or more workers weighing up to 310 pounds (140 kilograms) each with tools. Contact Gorbel, Inc. for assistance if heavier loads are required. \*\*\*\*\***

- C. Load: System shall be designed to support one or more workers weighing [310 pounds] [140 kilograms] each with tools.
- D. Configuration: Customizable system consisting of a series of frames constructed of floor anchored columns connected with a header beam, monorail beam perpendicular to and supported by the frames, a track on the bottom of the monorail, and a trolley inserted in track for anchoring worker.

**\*\*\*\* Monorail span will determine spacing of support frames, length of header beams, and spacing of columns. Refer to Gorbel product literature for allowable monorail spans and other values required for completing the following paragraphs. \*\*\*\*\***

1. Total monorail length: [\_\_\_\_\_] [feet] [meters].
2. Maximum allowable span of monorail beam: [\_\_\_\_\_] [feet] [meters].
3. Center-to-center spacing of frames supporting monorail: [\_\_\_\_\_] [feet] [meters].
4. Header beam length: [\_\_\_\_\_] [feet] [meters].
5. Center-to-center distance between columns supporting header beam: [\_\_\_\_\_] [feet] [meters].

**\*\*\*\*\* System can be designed for a maximum height of 26 feet (7.9 meters) from floor to tether track on monorail. \*\*\*\*\***

6. Installed height to bottom of tether track on monorail beam: [\_\_\_\_\_] [feet] [meters].
7. Column length: [\_\_\_\_\_] [feet] [meters].

- E. Construction: Fabricate fall arrest anchor system from ASTM A36 steel sections with finished ends and surfaces. Bolts shall comply with ASTM A325 and ASTM A490.

## **2.3 COMPONENTS**

- A. Columns: Fabricated by welding steel sections to form rectangular columns with steel plate top cap pre-drilled to receive header beam and bottom plate pre-drilled for anchoring column to concrete slab.
- B. Header beams: Fabricated by welding steel sections to form rectangular beams with steel plate end caps. Steel members shall be spaced to provided top and bottom continuous gap for bolting header to column cap and for suspending monorail from header.
- C. Monorail: Welded steel truss fabricated from tubular steel sections. Bottom chord of truss shall be single tether track or dual trussed track for holding tether trolley; Series F500 or F1000 as manufactured by Gorbel, Inc.
- D. Tether trolley: Wheeled, steel fabrication designed specifically to use with tether track specified in Paragraph 2.3.E for fall arrest systems and provide fluid movement and stability; Tether Trolleys as manufactured by Gorbel, Inc.
  - 1. Wheels: Equip each trolley with 3 pairs of wheels sized to roll within tether track.
    - a. Material: DURACOMP4 as provided Gorbel, Inc.
    - b. Profile: Provide wheels with 2 degree taper to match taper of tether track.
  - 2. Connection device: Equip bottom of trolley with swivel eye for securing shock-absorbing lanyard or self-retracting lifeline and which allows free movement beneath trolley and prevents twisting of the connector.
- E. Tether track:
  - 1. Type: Cold-rolled steel, enclosed track designed to accommodate easy, smooth movement without forcing or jamming of tether trolley and end trucks; Plain Tether Track Rail as manufactured by Gorbel, Inc.
  - 2. Profile: Rectangular, tubular section with continuous bottom slot to allow movement of trolley with connector. Bottom running flanges to have 2 degree taper to keep trolley centered. Flat, non-centering tracks are not acceptable.



3. End stops: Provide track with end stops to be field installed on track ends after tether trolley and is inserted into track.
- F. Accessories: Provide fall arrest anchor system with end stops, splices, fasteners, anchors, and other hardware as required for a complete, secure, structurally sound, safe installation as indicated on Drawings and reviewed shop drawings.

## **2.4 SHOP FINISHING**

- A. Steam wash steel components with iron phosphate solution and apply thermoset enamel finish. Colors shall be as selected by Architect from manufacturer's full range.
- B. Provide spray cans of matching colors, air-drying paint for field touch-up.
- C. Warning labels: Provide and factory install durable, colored, adhesive applied user warning labels in compliance with ANSI Z359, OSHA 1926, and other applicable regulatory requirements. Install on monorail or trolley as appropriate.
1. Maximum number of workers that may simultaneously use monorail fall arrest anchor system.
  2. Maximum worker weight.
  3. Maximum average arresting force.
  4. Maximum arresting force.
  5. Only one worker anchored to trolley.
  6. Warning to inspect before using.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Coordinate provision of fall arrest anchor system with:
1. Provision of fall arrest harnesses and connectors provided by others in accordance with [Section 01 10 00 - Summary] [Section 41 67 19 - Plant Safety Equipment]. Ensure that attachment of connectors is compatible with tether trolleys being provided.
  2. Construction of cast concrete slab supporting fall arrest system specified

in Section 03 30 00 - Cast-in-Place Concrete.

a. Ensure slab complies with the following minimum requirements:

- 1) Minimum slab thickness: [6 inches] [152 mm].
- 2) Minimum concrete compressive strength: [3,000 pounds per square inch] [211 kilograms per square centimeter].
- 3) Reinforcement: Adequate to resist loads from fall arrest system and thermal movement.

B. Prior to installation:

1. Verify site conditions are ready to receive fall arrest anchor system.
2. Inventory parts. Verify all required components are available and undamaged.
3. Verify concrete slab has cured 7 days minimum and is free of cracks.
4. Accurately locate, space, and mark on slab locations for columns and line for monorail.

### **3.2 FALL ARREST SYSTEM INSTALLATION**

A. Install fall arrest anchor system in accordance with manufacturer's instructions and reviewed shop drawings.

B. Do not modify system components in any manner without advance, written approval from system manufacturer.

C. Installation of free standing, floor mounted columns:

1. Position column in place with cap plate oriented to receive header beam.
2. Using holes in column base plate as template, drill holes in concrete slab. Vacuum and brush dust away.
3. Install anchor bolts in accordance with bolt manufacturer's instructions.
4. Ensure that column is plumb and accurately aligned. Shim or grout base plate as required.
5. Tighten anchor bolt nuts to manufacturer's recommended torque.

**D. Installation of header beams:**

1. Position beam on two installed supporting columns.
2. Use clamp plates and hardware to attach header beam to column top plate.
3. Verify beam is level and tighten bolts to 95 foot-pounds of torque.

**E. Installation of monorail:**

1. Position sections of monorail truss as detailed on reviewed shop drawings.
2. Lift and support monorail section in place under header beams.
3. Use spine clamp angles, clamp plates, and hardware provided to attach monorail to header beams.
4. Where sections of monorail meet, use splice joint and truss splice plates to securely join sections. Maximum gap between truss chords shall be [1/16 inch] [1.5 mm].
5. Verify monorail is level within plus or minus [1/8 inch] [3 mm] and is perpendicular to header beams. Correct deviations as required.
6. Tighten bolts to full compression of lockwasher but not to exceed 50 foot-pounds of torque.

**F. Installation of tether trolley:**

1. Install trolley stop at one end of tether track on bottom of monorail.
2. Clean inside flanges of track with clean, dry cloth to remove dirt, grit, or debris. Do not use cleaning solution.
3. Attach energy absorbing lanyard or self-retracting lifeline to trolley eye nut using ANSI approved hardware supplied with connector.
4. Roll trolley into tether track. Ensure trolley travels smoothly for full length of track.
5. Install trolley stop at open end of tether track.

**3.3 COMPLETION**

- A. Inspect installed fall arrest anchor system. Verify:

1. All tether track end stops are securely installed.
  2. All bolts are tight and lockwashers fully compressed.
  3. Warning labels are legible from ground or egress location.
- B. Install yellow rubber caps on exposed ends of tether track and monorail.
- C. Clean surfaces. If necessary, touch-up paint damage, scratches, and blemishes with manufacturer-provided matching paint.
- D. Protect fall arrest anchor system from other construction operations.

### **3.4 FIELD QUALITY CONTROL**

- A. In presence of Owner's Person of Authority for Fall Safety and Architect, field perform inspections and testing.
1. Move tether trolley through entire travel on monorail to ensure system is clear of obstructions and components move freely and smoothly.
  2. Field test system with connector and simulated load attached to swivel eye of tether trolley. Ensure system operates functionally, safely, and smoothly. Adjust as required and correct deficiencies.
  3. Perform other tests as required by state or local jurisdictions.
  4. Adjust monorail fall arrest anchor system as required and correct deficiencies.

### **3.5 DEMONSTRATING AND TRAINING**

- A. In accordance with Section 01 79 00 - Demonstration and Training, provide demonstration and training session for Owner's Person of Authority for Fall Safety and other designated representatives and potential system users.
- B. Demonstrate complete operation and maintenance of monorail fall arrest anchor system.
- C. Review OSHA and ANSI required inspections of system before each use, inspections and maintenance after fall arrest event, and for periodic inspections recommended by manufacturer. Provide and discuss manufacturer's suggested Pre-Use Check List and Inspection and Maintenance Schedule.

**END OF SECTION**