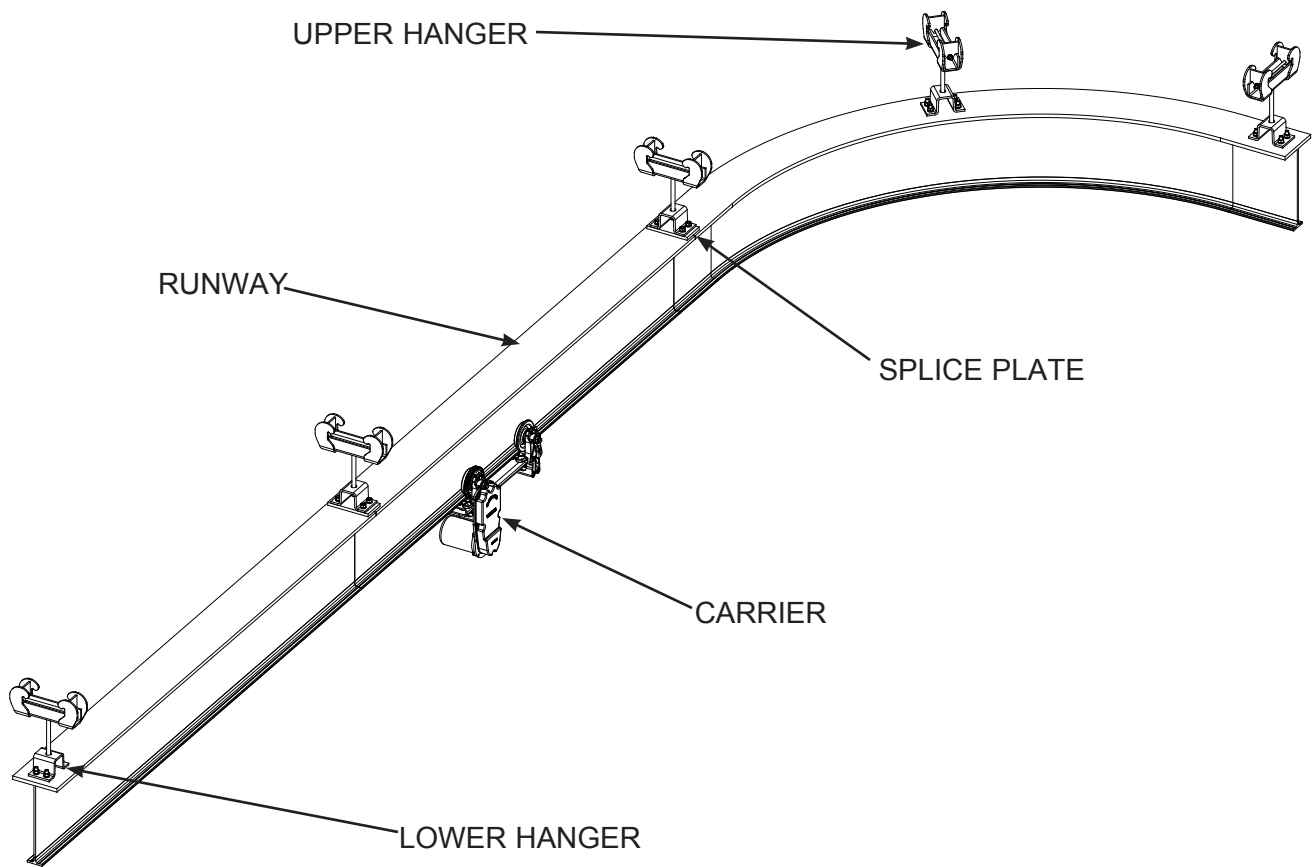


Installation, Operation, & Maintenance Manual



IMPORTANT!
DO NOT DESTROY

Monorail Tarca® System

Gorbel® Customer Order No. / Serial No. _____

Gorbel® Dealer _____

Date _____
Month _____ Year _____

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Questions? Concerns? Comments? Please call (800) 821-0086

INTRODUCTION

Thank you for choosing Gorbel® Tarca® Systems to solve your material handling needs. The innovative design and heavy-duty construction of the Gorbel® Tarca® Systems will provide a superior quality product that will offer years of long term value. The hoist weight allowance is 15% of the crane's capacity (for example, a crane rated for 6000 pounds, allows for a 6000-pound live load plus 900 pounds for the weight of the hoist). There is also an allowance of 15% of the crane capacity for impact caused by hoist use. Gorbel® Tarca® Systems will provide many years of dependable service by following the installation and maintenance procedures described herein.

Monorails are shipped in various stages of assembly and are installed under varying circumstances. As a result, a complete guide with descriptions covering all variations is not possible. The following instructions are only to be used as a general guide. Attention should be paid to the warnings and safety suggestions posted in this manual and on the equipment.

Dimensions contained in this installation manual are for reference only and may differ for your particular application.

Normal safety precautions: These include, but are not limited to:

- Checking for obstructions in crane travel
- Checking that all bolts and threaded rods are tight and have lock washers
- Making sure that end stops are in place and functional (i.e. stopping rolling equipment from exiting rail)
- Making sure that festooning cannot be snagged or pinched, whether it is electric or pneumatic
- For additional safety precautions, see page 25.

WARNING

Please read entire manual prior to starting installation.

WARNING

Gorbel Inc. assumes no responsibility for adequacy or integrity of the mounting surfaces or the structure that the crane may be mounted to. Gorbel Inc. will not be liable for any loss, injury or damage to persons or property, nor for damages of any kind, resulting from the failure or defective operation of any materials not supplied directly by Gorbel Inc. Bracing systems, if used, must be approved by a local professional engineer.

WARNING

Before installing any crane system, it is critical you determine that your building will safely support the loads.

WARNING

Sway bracing is required (except when using flush mounted hangers). For more information see pages 23-24.

WARNING

Equipment described herein is not designed for, and should not be used for, lifting, supporting or transporting humans. Failure to comply with any one of the limitations noted herein can result in serious bodily injury and/or property damage. Check State and Local regulations for any additional requirements.

WARNING

Crane cannot be utilized as a ground: A separate ground conductor is required. For example, systems with 3 phase power require three conductors plus one ground conductor.

WARNING

Reference the American Institute of Steel Construction (AISC) Manual of Steel Construction Specification for Structural Joints using ASTM A325 or A490 Bolts, Installation, Pretensioned Joints, Calibrated Wrench Pretensioning for the proper procedures to follow when using any torque tightening method.

INSTALLATION

➡ **TIP:** Packing list can be found in envelope attached to hardware box: General Arrangement Drawing can be found inserted in this installation manual.

STEP 1 - PRE-ASSEMBLY

- 1.1 Read entire installation manual **before** you begin installing your crane.
- 1.2 Study all instructions and drawings provided in this manual.
- 1.3 Check all hole punchings, beam dimensions and suspension fittings prior to installation.
- 1.4 Check packing list to make sure **correct quantity** of parts is included. Any missing items should be noted and reported to a Gorbel® dealer.
- 1.5 Tools and materials (by others) typically needed to assemble crane are as follows:
 - Mallet
 - Tape measure
 - Hand tools
 - Clamps (large C)
 - Spud wrench
 - Leveling tools (transit, laser level, water level, etc.)
 - Lifting device to lift heavy components
 - Welder (if splices are welded)
 - Torque wrench
 - Steel shims
 - Ladders/man lifts
 - Large square
 - Shop brush

STEP 2 - HANGER INSTALLATION

- 2.1 Mark top hanger placement on the building support beams and runway/monorail track (refer to the **General Arrangement Drawing**, inserted in this manual, for hanger placement). Installation guidelines can be found on page 25.
- 2.2 Drill holes in superstructure or support. Attach ceiling fitting (upper hanger) to superstructure or support. Feed threaded rod through and adjust load nut finger tight to threaded rod. Lock set screw on load nut before final adjustment of threaded rod.
- 2.3 Attach support fitting (lower hanger) to threaded rod and adjust load nut finger tight to threaded rod. Install roll pin through threaded rod. Lift runway/monorail track into place. Install bolts through support fitting, top flange plate, and top flange of beam. Refer to **Chart 2A** for proper nut torque.
- 2.4 Tighten set screw in load nut after adjusting to proper height.
- 2.5 Reference **Diagrams 2A** (below), **2B** (page 4), **2C** (page 4), or **2D** (page 5) for specific hanger assembly details.

WARNING

Threaded rod must have a minimum of two threads beyond the hexnut.

BOLT DIA.	SAE GR. 2	SAE GR. 5 & ASTM A-325	SAE GR. 8 & ASTM A-490
1/2"	50 ft.-lbs.	75 ft.-lbs.	110 ft.-lbs.
5/8"	100 ft.-lbs.	150 ft.-lbs.	220 ft.-lbs.
3/4"	125 ft.-lbs.	260 ft.-lbs.	380 ft.-lbs.
7/8"	165 ft.-lbs.	430 ft.-lbs.	600 ft.-lbs.
1"	250 ft.-lbs.	640 ft.-lbs.	900 ft.-lbs.
1 1/4"	500 ft.-lbs.	1120 ft.-lbs.	1820 ft.-lbs.
1 1/2"	870 ft.-lbs.	1940 ft.-lbs.	3160 ft.-lbs.

Chart 2A. Torque Chart.

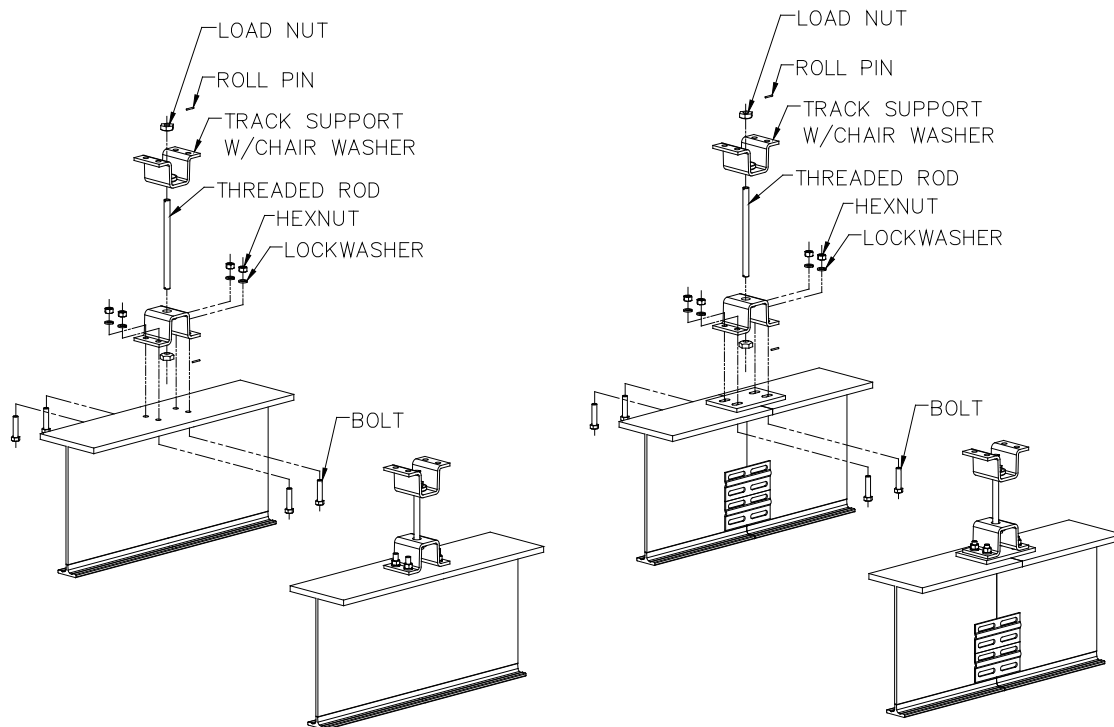


Diagram 2A. Single Rod Hanger Assembly
(3/4" - 1" Diameter Rod).

STEP 2 - HANGER INSTALLATION (CONTINUED)

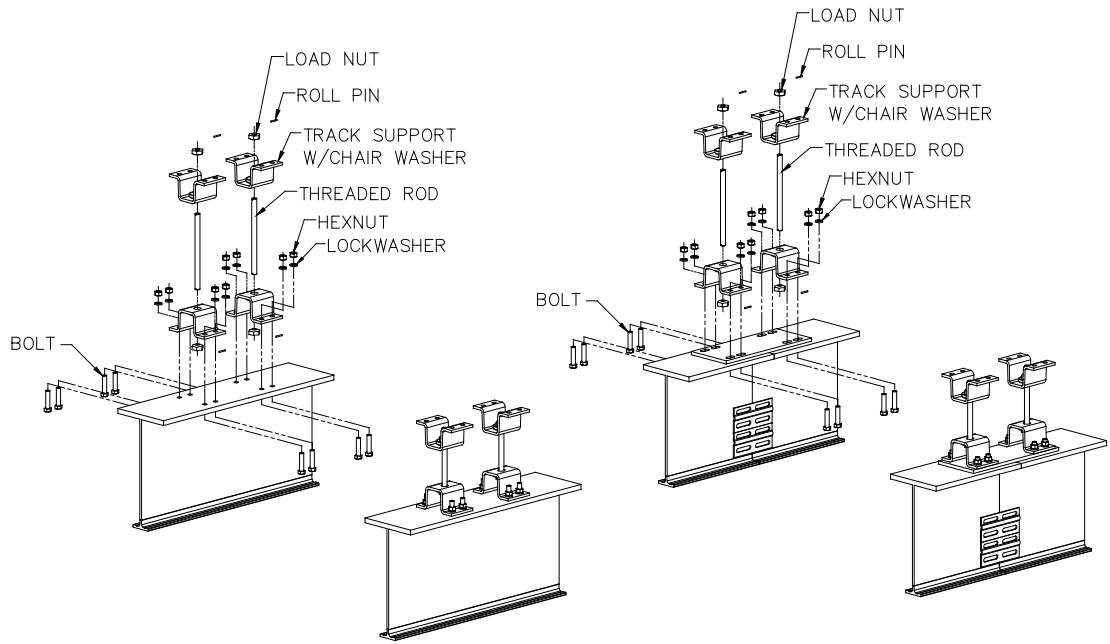


Diagram 2B. Double Rod Hanger Assembly
(3/4" - 1" Diameter Rod).

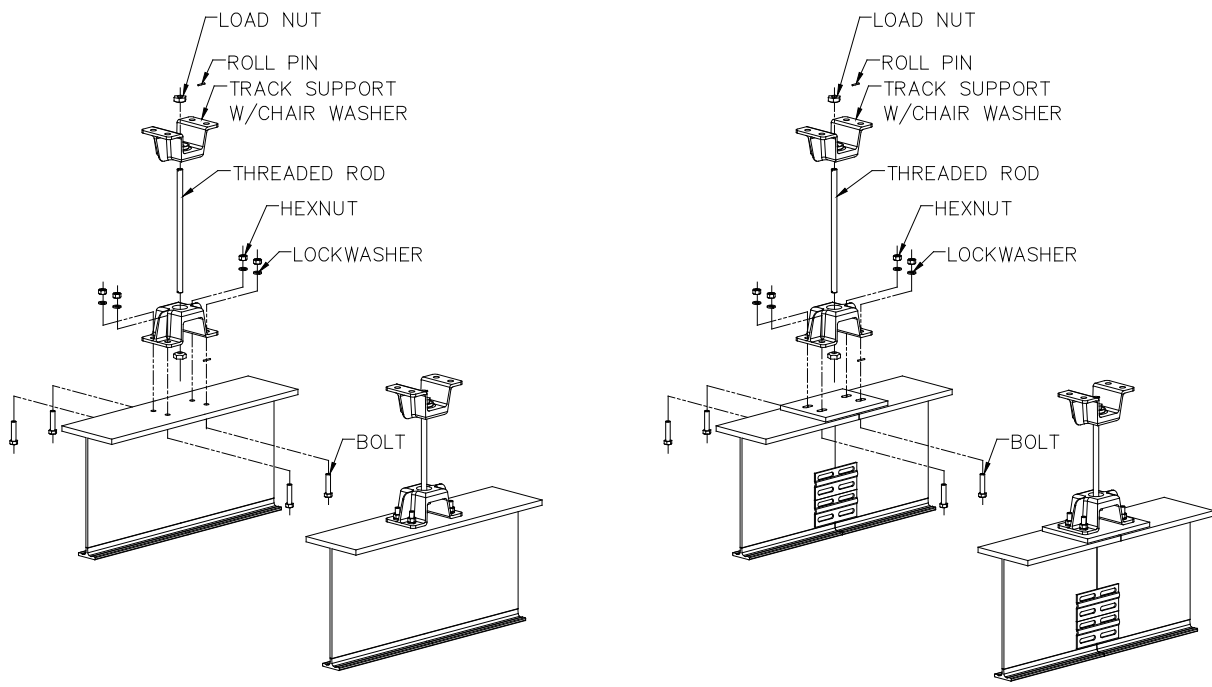


Diagram 2C. Single Rod Hanger Assembly
(1 1/4" Diameter Rod).

STEP 2 - HANGER INSTALLATION (CONTINUED)

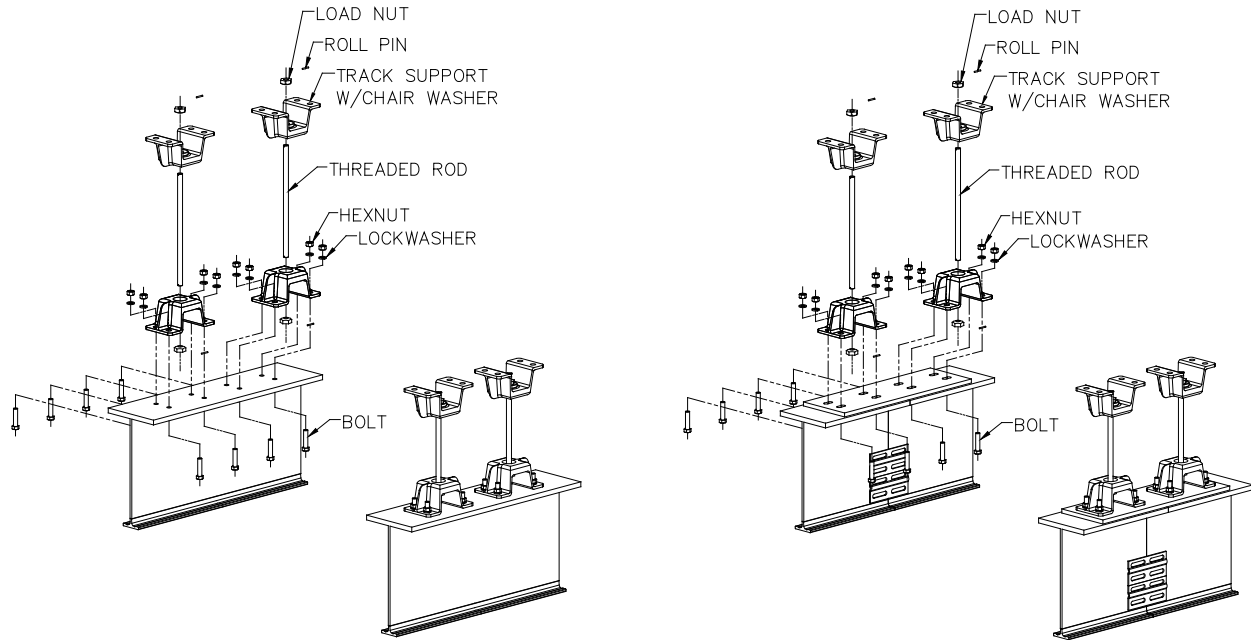


Diagram 2D. Double Rod Hanger Assembly
(1 1/4" Diameter Rod).

STEP 3 - RUNWAY INSTALLATION

Curve Installation Notes (skip if no curves are used)

Note: Curve radii must be at least 1.5 times the wheelbase of the two-head carrier or the pin centers of a four-head carrier.

Note: Flangeless wheels with guide rollers are required on carrier heads to navigate through curves.

- Curves are not available in Tarca® series over 5000 and Super Tarca® series over 8050. It may be necessary to splice different series of rail by either cutting down the larger rail or building up the smaller rail (done by the factory). See step 3.1 for detailed instructions.
- Due to manufacturing tolerances of curved sections of rail, it may be necessary to accommodate twist, roll, opening of curve, or other conditions during installation. This may require the use of shims, pry-bars, come-alongs, or other techniques common to installing heavy structural steel members to fit rail sections as needed.
- See Sway Bracing section for specific requirements for sway bracing curved sections.

Splice Joint Instructions

WARNING

Reference the General Arrangement Drawing for splice locations. It will be necessary to install adjacent runways at the same time.

- 3.1 Bring the ends of the track sections together as close as possible (*diagram 3A*).
- 3.2 Align holes in top splice plate with the slots in the top flange of the rail. If using welded web splice plates, tighten top splice plate hardware; this will help align the top flange portion of track sections. If using bolted web splice plates, leave top splice plate hardware loose to ease alignment of web holes.

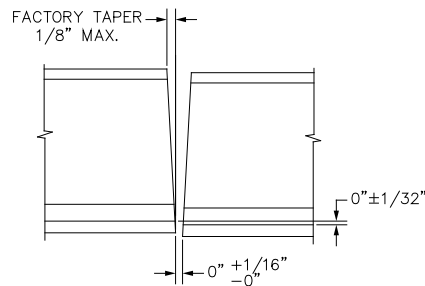


Diagram 3A. Rail Alignment.

STEP 3 - RUNWAY INSTALLATION (CONTINUED)

- 3.3 Place web splice plate(s) on each side of web section. Align plate as shown (*diagrams 3B* and *3C* for welded splice or *diagrams 3E* and *3F* for bolted splice).

WARNING

Track sections and web plate need to be carefully aligned before field welding of plates to allow smooth transition between sections.

- 3.4 Web splice plates to be welded in accordance with American Welding Society (AWS) specification D1.1 using E70xx electrodes (*diagram 3D*).

WARNING

If welding of lower track is desired (not required), different electrodes are required for mild steel vs. hardened steel. E7018 is used for mild steel only (web and top flange). E11018 must be used for hard steel and may also be used for mild steel.

- 3.5 Check to see that the transition from one track to the other is smooth: no raised areas to inhibit carrier or end truck operation (*diagram 3B*).
- 3.6 For additional runways repeat Steps 3.1 through 3.5.

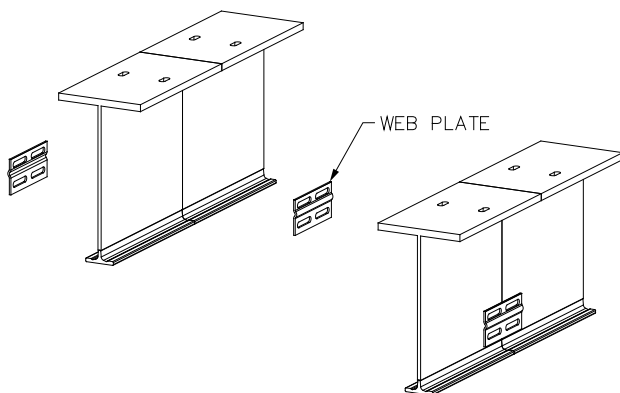


Diagram 3B. Welded splice (4200-4600 Tarca® beam).

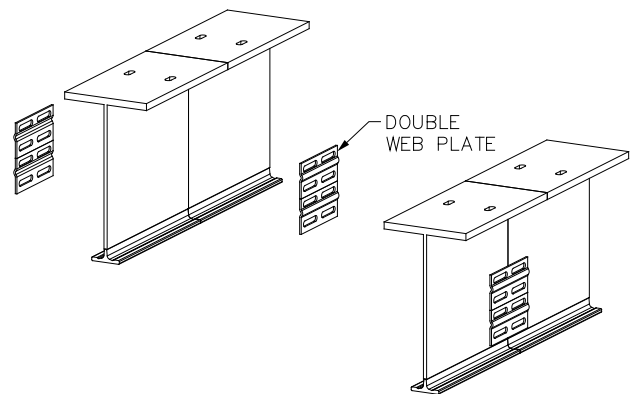


Diagram 3C. Welded splice (5000 & Larger Tarca® beam).

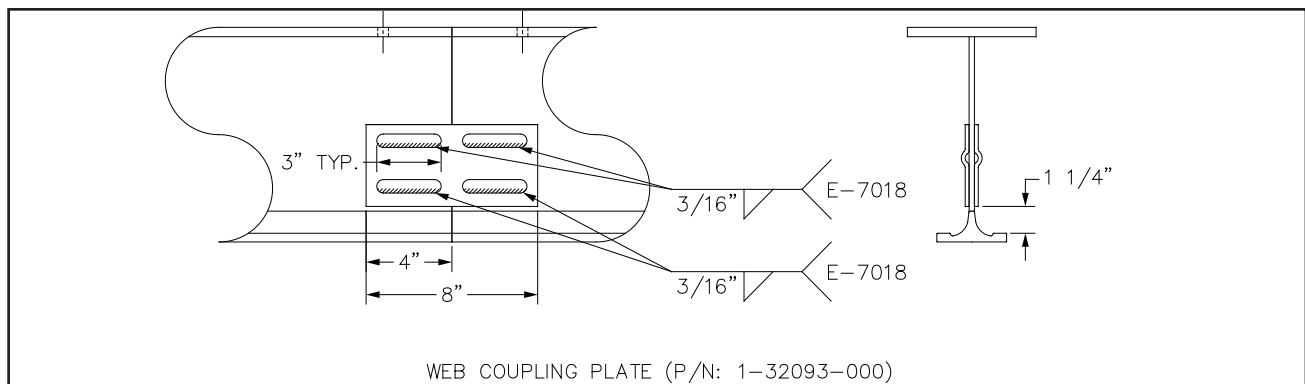


Diagram 3D. Splicing Runways together.

STEP 3 - RUNWAY INSTALLATION (CONTINUED)

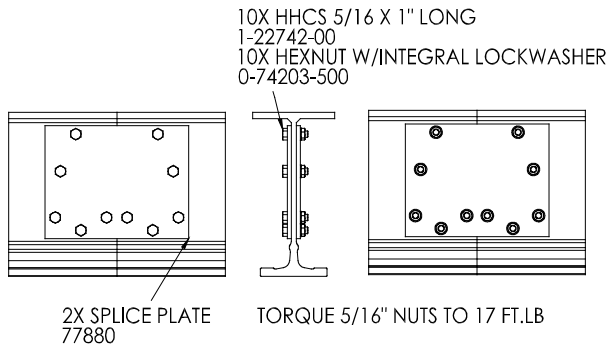


Diagram 3E. Bolted splice (4200 - 4600 Tarca® beam).

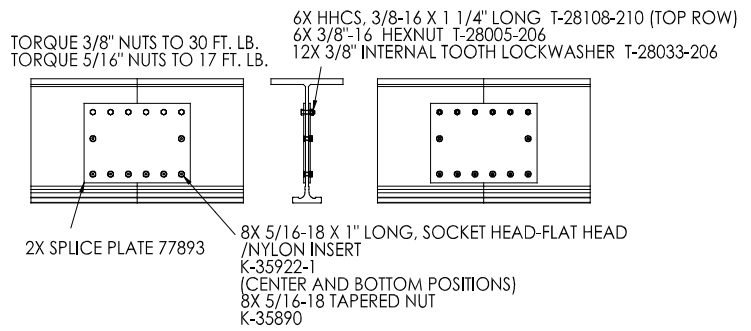


Diagram 3F. Bolted splice (5000 and larger Tarca® beam).

Special notes on “Undercutting” and “Stooling” (performed by factory to order specifications)

When joining rail sections of different depths, it is necessary to have the larger rail cut down (undercutting) or the smaller rail built up (stooling). When the difference in rail depths is 4” or less, undercutting is typically used; stooling is used when the difference is greater than 4”. See *diagrams 3F - 3K*.

In either case, it may be necessary to grind the T-section weld before installing splice plates.

Note: Diagrams 3H and 3J show double rod suspension - single rod suspension may also be applied.

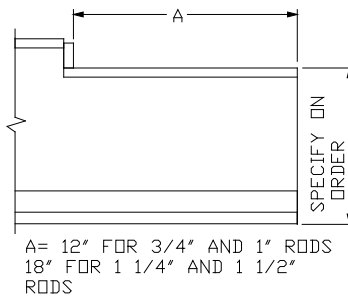


Diagram 3F. Rail depth 4” or less.

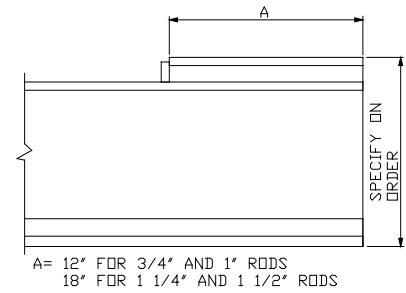


Diagram 3G. Rail depth greater than 4”.

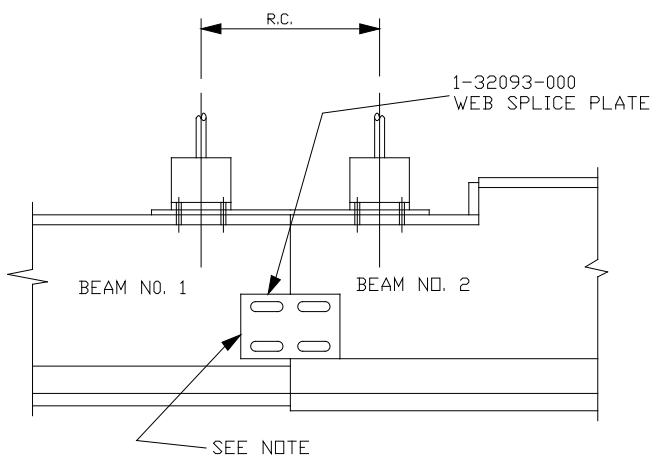


Diagram 3H. Undercut end with different rail tread thickness.

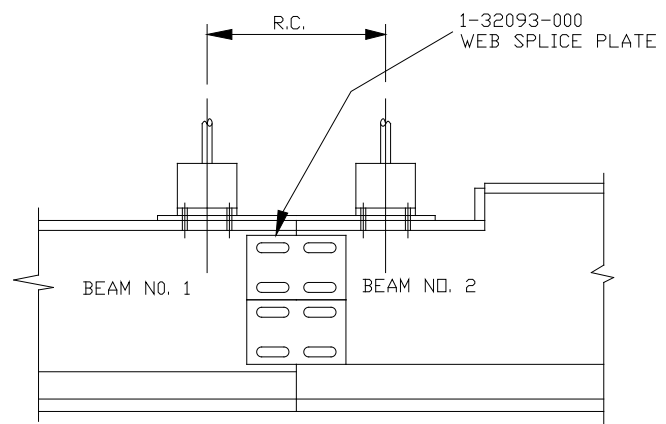


Diagram 3I. Undercut end with identical rail tread thickness.

STEP 3 - RUNWAY INSTALLATION (CONTINUED)

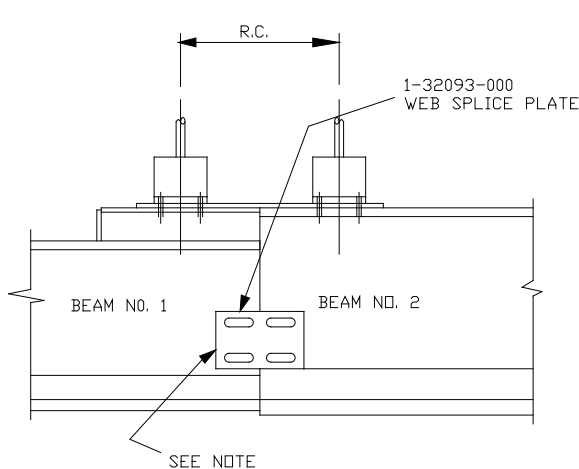


Diagram 3J. Stooled end with different rail tread thickness.

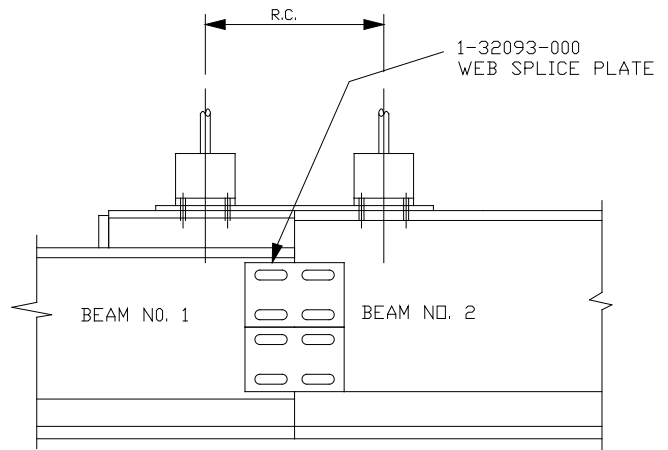


Diagram 3K. Stooled end with identical rail tread thickness.

STEP 4 - RUNWAY END STOP INSTALLATION

- 4.1 End stops are required and must be installed at the ends of the carrier or trolley travel (*diagram 4A*).

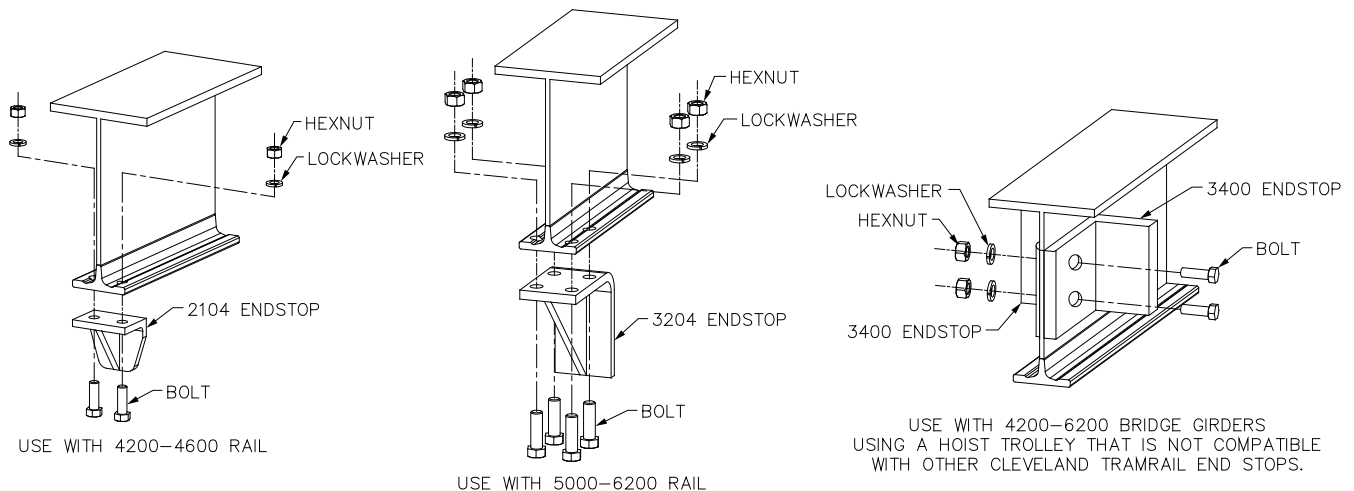


Diagram 4A. End stop.

- 4.2 The standard end stops are for normal applications where contacts with end stops are infrequent and travel is at slow speed.
- 4.3 When service conditions are such that the carrier or trolley will contact the end stop frequently or at high speed, spring bumpers or other energy absorbing type end stops are available and should be used. For their application and detail contact our Customer Service Department.

BOLT OR SCREW SIZE (inches)	SAE GR.2	SAE GR.5 & ASTM A-325	SAE GR.8 & ASTM A-490
1/2	50 lb ft	75 lb ft	110 lb ft
5/8	100 lb ft	150 lb ft	220 lb ft
3/4	125 lb ft	260 lb ft	380 lb ft
7/8	165 lb ft	430 lb ft	600 lb ft
1	250 lb ft	640 lb ft	900 lb ft
1 1/4	500 lb ft	1120 lb ft	1820 lb ft
1 1/2	870 lb ft	1940 lb ft	3160 lb ft
IDENTIFICATION MARKS ON BOLTS HEADS	NO MARK	A325	A490
TURN OF THE NUT METHOD IS ACCEPTABLE			

Chart 4A. Torque Chart.

STEP 5 - CARRIER INSTALLATION

5.1 If ordered, Gorbel will provide one of the following motor driven carriers:

Motor Driven Carriers With Electric Hoists (Hoists by Others) - WT and WS Series

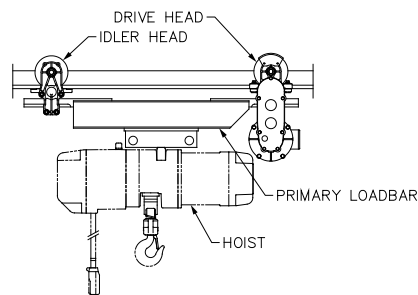


Diagram 5A. WT Carrier (2 Head).

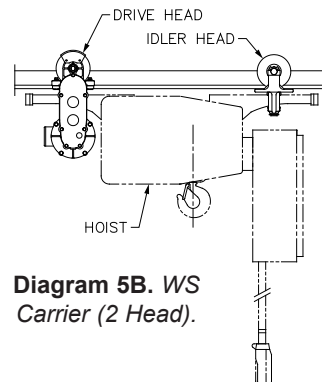


Diagram 5B. WS Carrier (2 Head).

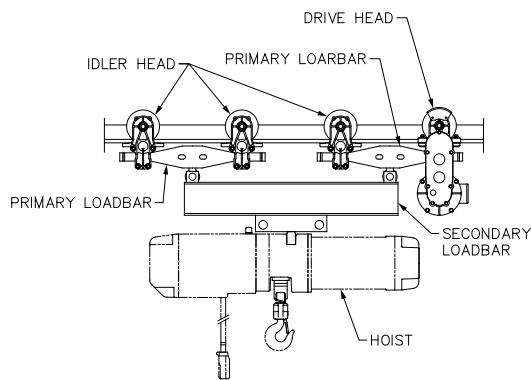


Diagram 5C. WT Carrier (4 Head).

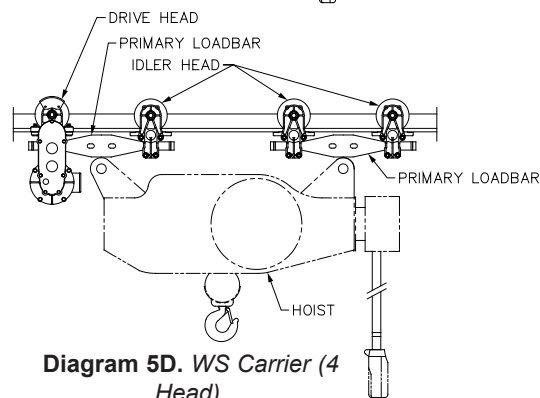


Diagram 5D. WS Carrier (4 Head).

- 5.2 Clean bridge track tread surface with a clean, dry cloth (**do not use any kind of cleaning solution**) to remove grit or debris that may have collected during shipping, storage, or installation.
- 5.3 Be sure end stop is installed at the opposite end of runway that the end carrier is loaded into.
- 5.4 If possible install carrier by inserting onto end of runway.
- 5.5 If end clearance prohibits sliding the carrier onto track, drive and idler heads have to be split and reassembled on the runway. If this is the case, both end stops should be installed. Single piece frame type idler heads can be installed on the track by removing the wheels.
- 5.6 If a tow arm is being utilized assemble the tow arm weldment to the carrier on the festooning side of the runway (**diagram 5E**).
- 5.7 Install remaining endstop on the runway (Step 4, on page 9).
- 5.8 Make sure all connections are secure using the proper hardware and torque to specification.
- 5.9 If hoist and carrier were not pre-assembled, assemble trolley to hoist per manufacturer's assembly instructions.

STEP 6 - MOTOR WIRING

NOTE: Brake control must be on separate circuit.

WARNING
 Typical schematics shown for motors that are reconnectable for high or low voltage. Refer to supplemental drawings and J-box on motor for your specific design.

- 6.1 Wire according to appropriate figure below. For SEW motors refer to **diagram 6C**.
- 6.2 Motor and brake voltages must be identical.

MOTOR JUNCTION BOX CONNECTIONS
 - HIGH VOLTAGE 460V

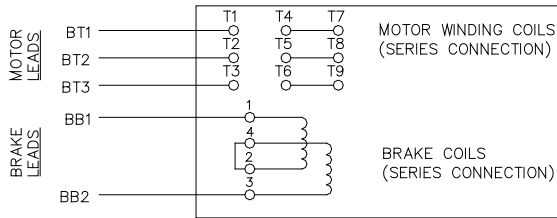


Diagram 6A.

MOTOR JUNCTION BOX CONNECTIONS
 - LOW VOLTAGE 230V

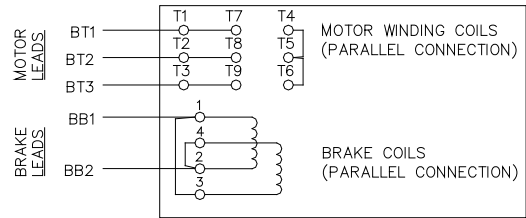


Diagram 6B.

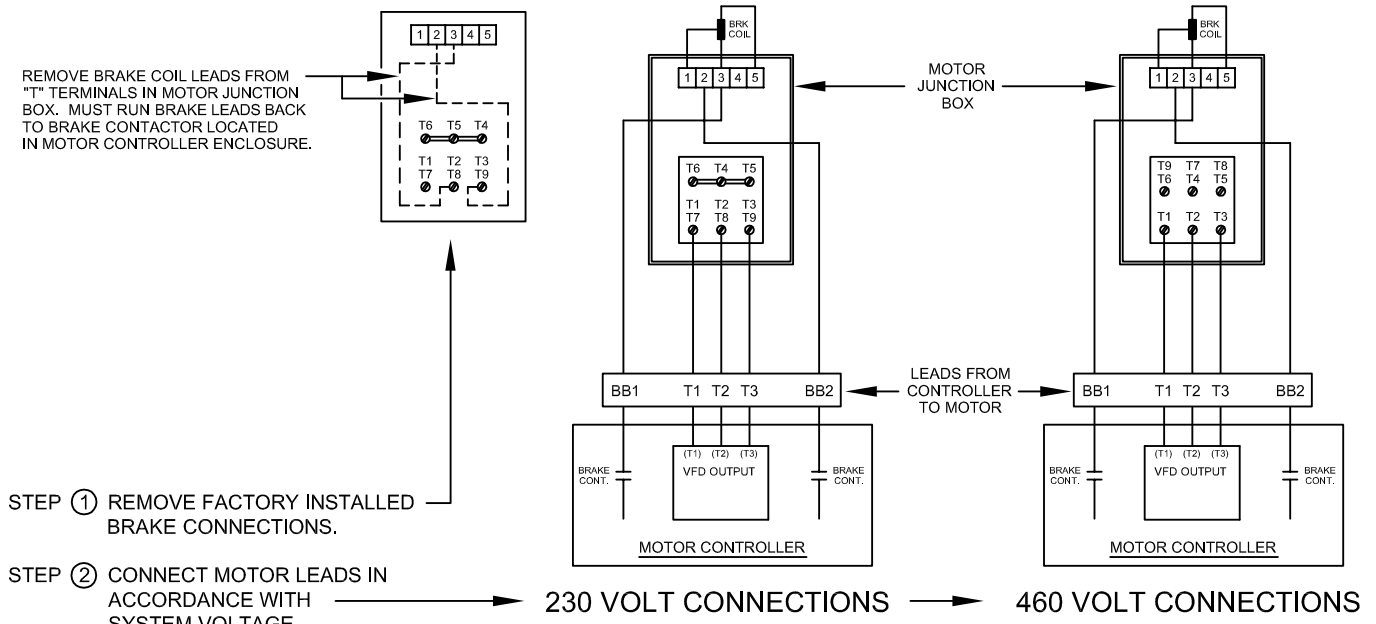


Diagram 6C.

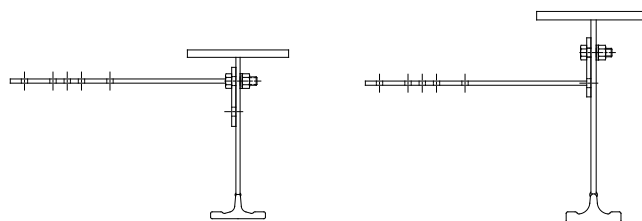
STEP 7 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFE-LEC)

(for Safpowrbar® Runway Conductor Bar Installation, proceed to Step 8, page 14)

Note: For any systems with curves, SAFPOWRBAR® must be used. Safe-Lec is not available from the Gorbel® factory for curves.

TIP: Install brackets inboard of runway closest to enclosure (*diagram 7H*, page 13).

7.1 Bolt hanger brackets to web of runway with 1/2" hardware. Refer to *diagram 7A* for beam mounting position.



4200-4600 TARCA

5000 & UP TARCA

Diagram 7A. Conductor bar mounting bracket.

7.2 The bracket has hole patterns as shown in *Diagram 7B*. Bolt conductor bar hangers to brackets according to *Diagram 7C*.

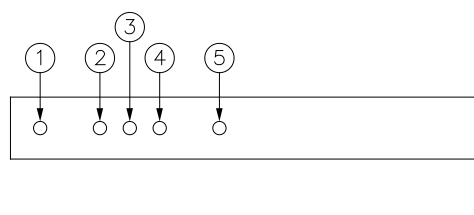
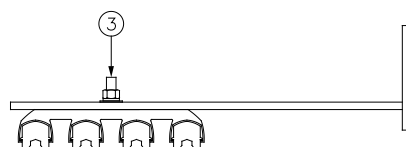
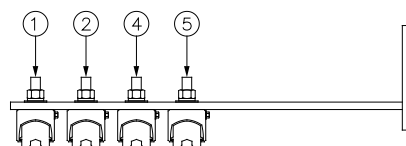


Diagram 7B.

7.3 Each system requires the use of anchor clamps. The anchor clamps will replace one regular conductor bar hanger and serve to prevent the bars from sliding back and forth on the runways. These anchor clamps should be placed in the center of the conductor bar system (*Diagram 7D*).



Four bar hanger.



Anchor clamps for 4-bar set-up.

Diagram 7C.

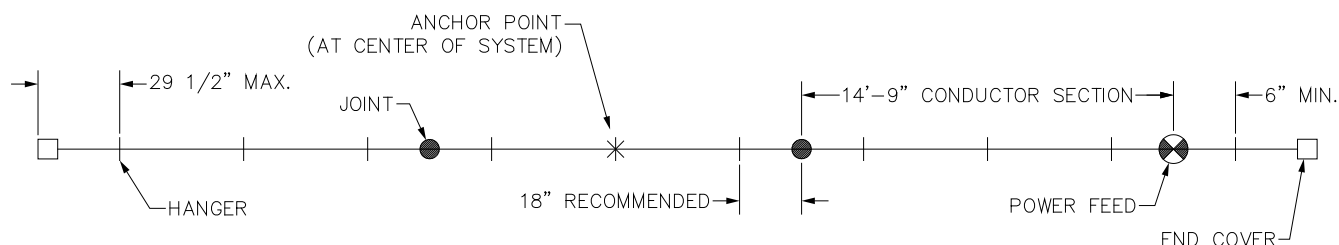


Diagram 7D. Typical conductor bar.

STEP 7 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFE-LEC) (CONT.)

(for Safpowrbar® Runway Conductor Bar Installation, proceed to Step 8, page 14)

Note: For any systems with curves, SAFPOWRBAR® must be used. Safe-Lec is not available from the Gorbel® factory for curves.

7.4 Attach collector bracket to side of trolley according to **Diagram 7E**. Bracket may be tack welded or bolted into place. If bolting, locate the bracket as shown, mark the hole locations, and drill three Ø3/8" holes.

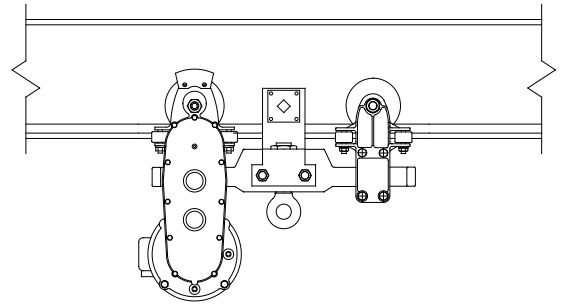


Diagram 7E.

7.5 Slide the first collector onto the collector bracket as shown in **Diagram 7E**.

7.6 Position collector so it lines up with the first conductor bar (**Diagram 7F**) and tighten collector bolts to clamp it into place.

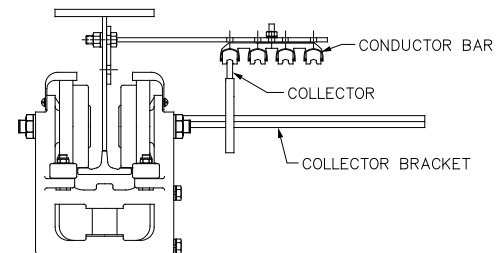


Diagram 7F.

7.7 Run a minimum of 4COND 12AWG SO(W) (recommended) cable from collectors to electrical enclosure.

7.8 Strip the end of the collector wire and insert into the collector as shown in **Diagram 7G**.

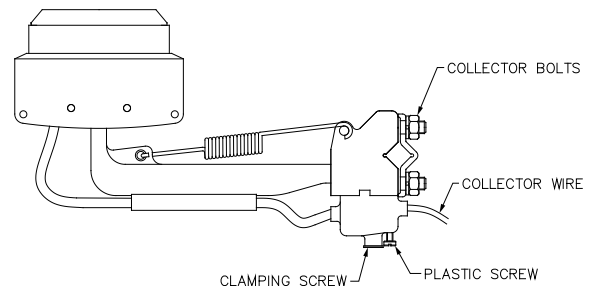


Diagram 7G.

7.9 Clamp the wire with the two screws. The plastic screw should tighten down on the wire's insulation. When tightening the clamping screw there will be some resistance. Keep tightening until the wire is clamped firmly in place.

7.10 Repeat steps 7.5 through 7.9 for the remaining collectors.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Special notes for installing SAFPOWRBAR® on curves

- The insulating cover on curved sections of conductor bar ships installed along the entire lengths of the section; it must be trimmed back 2-1/8" from the end if a splice connection is to be made.
- Refer to **diagram 8A** for orientation of curved pieces of conductor bar. Each piece comes marked to designate its position on the curve.
- Web mounted support brackets should be mounted every 33" along curves.
- When using top flange mounted brackets, be aware that due to the manufacturing process of curves the top flange may be slightly out of parallel to the tread surface, and it may be necessary to accommodate this variation during installation.
- For easier installation, use SAFPOWRBAR® at a curve and work outward.

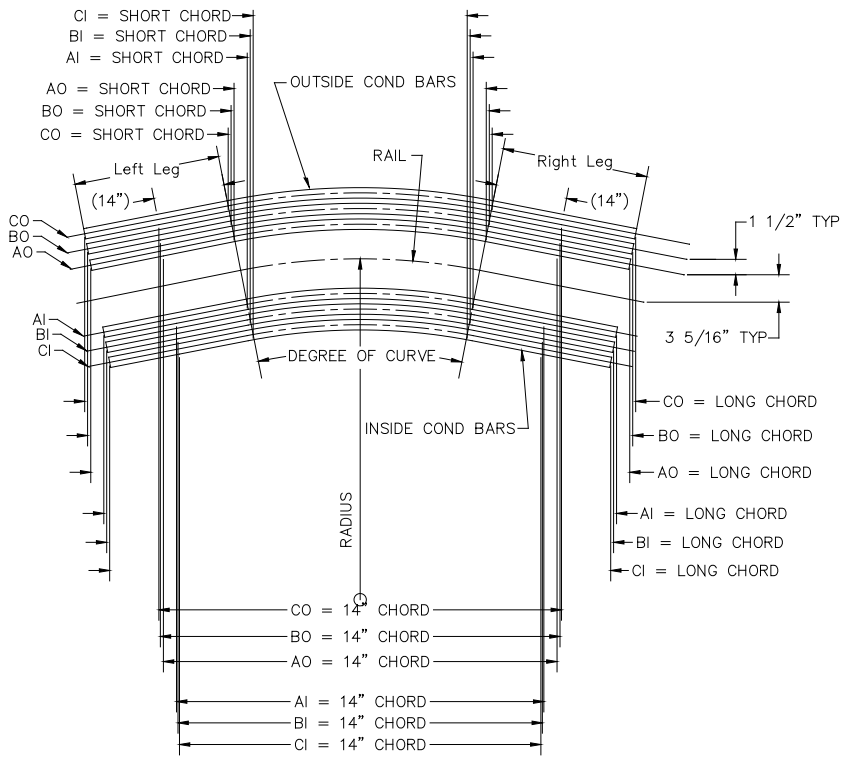


Diagram 8A.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Mounting Insulating Cover on Bar

- 8.1 Under normal circumstances the insulating cover will be shipped mounted on the bar, but in case removal or replacement is necessary, the following procedure is suggested.
- 8.2 Starting the cover 2-1/8" down from the end of the bar and flat on top of the bar, mold the cover down over the bar and work the lips of the cover over the legs of the bar. The conductor bar is furnished in lengths of 21'-0" and the cover is furnished in lengths of 20'-7-3/4" which allows 2-1/8" of the bar to extend beyond the cover at each end. The cover fits tightly on the bar and does not require any additional clamps to hold it in place.

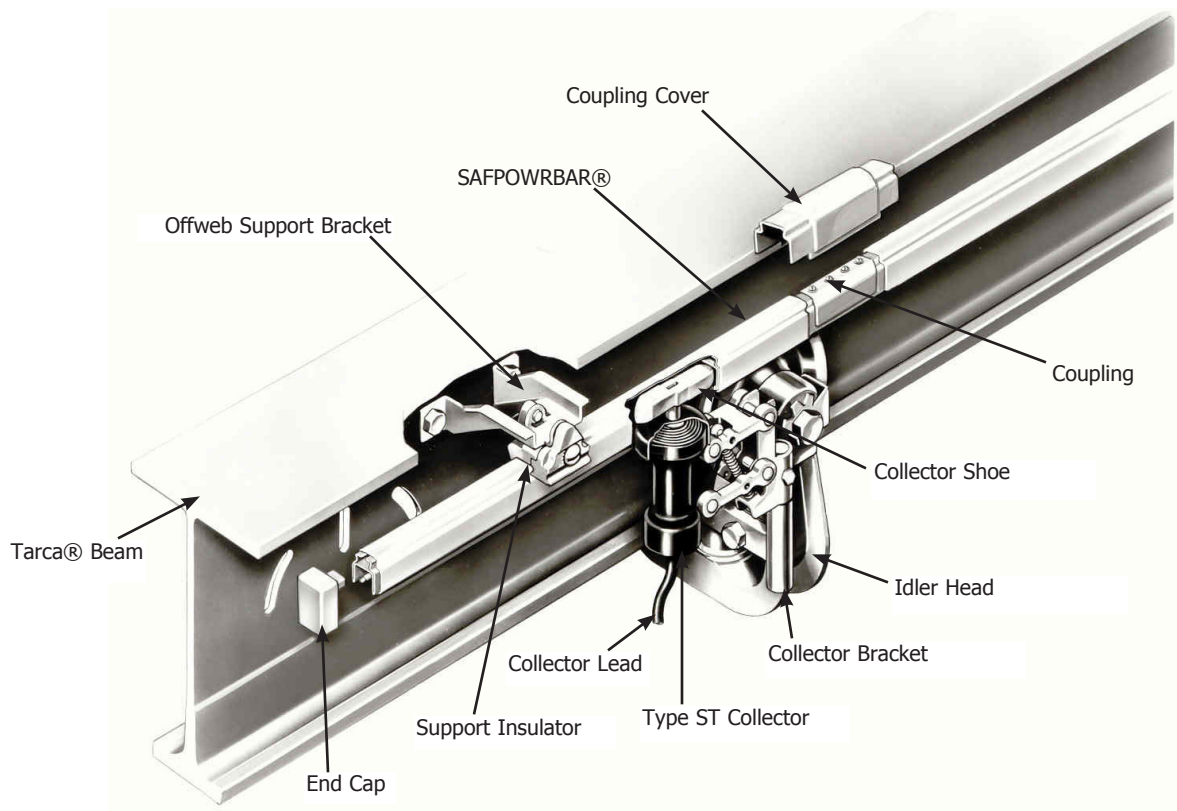


Diagram 8B.

Conductor Bar Mounting and Brackets

- 8.3 The conductor bar is held on by insulators which are attached to mounting brackets (*diagram 8B*). There are two types of mounting brackets as shown in *diagram 8C*.

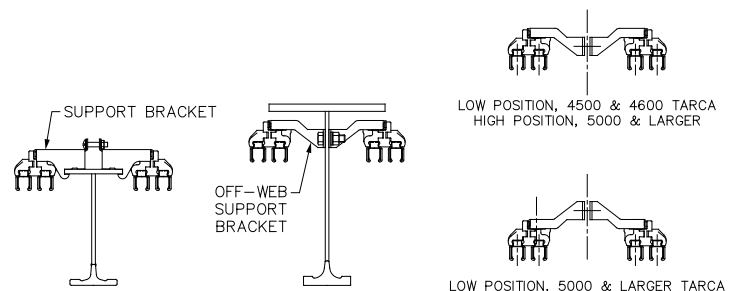


Diagram 8C.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Mounting Conductor Bar and Brackets (Continued)

- For 8" and 8-1/2" Tarca® track with wheels 5" diameter or less, the conductor bar mounting brackets are mounted across the top flange of the track. Attach brackets by fitting the notched ends over the top flange of the beam and securing with the provided screw, lockwasher, and hexnut (**diagram 8D**). **Note:** Bracket configuration shown may be different than yours.

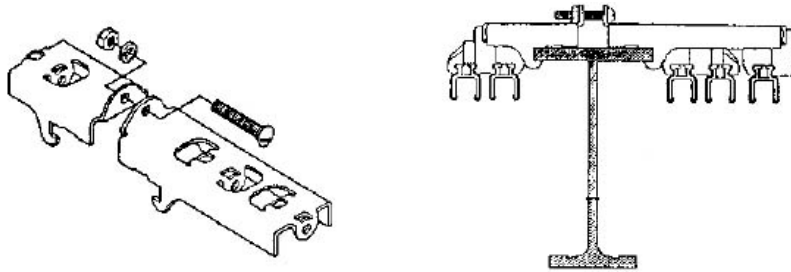


Diagram 8D.

- For Tarca® track 10" and taller, the conductor bar mounting bracket is mounted to the pre-drilled Tarca® web holes. Attach brackets by inserting provided bolts through the near side bracket, through the holes in the beam web, and through the far side bracket, securing brackets with lockwashers and hexnuts (**diagram 8E**). **Note:** Bracket configuration shown may be different than yours.

Based on wheel size, brackets will be mounted in "high" (8" from the rail tread to the underside of the conductor bar) or "low" (6-3/16" from the rail tread to the underside of the conductor bar) positions. Low position is used when carriers have 5" diameter or smaller wheels. High position is used when carriers have 7" or smaller, but greater than 5" diameter wheels (5000 series and larger Tarca® rail only).

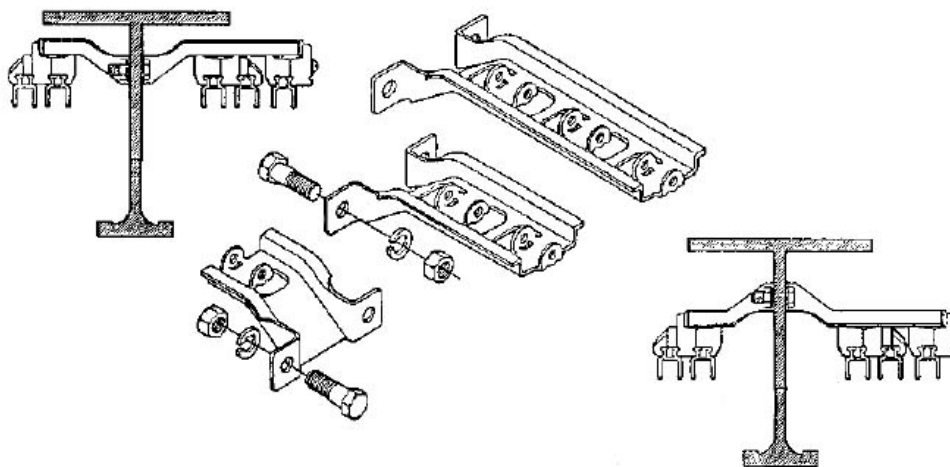


Diagram 8E.

8.4 The standard spacing for the mounting brackets on straight rail sections (web and flange mounted) is 5'-6".

*Light rails typically have holes drilled every 33"; it is only necessary to use every other set of holes.

**Hole spacing along curved sections should be 33" regardless of rail size.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Mounting Conductor Bar and Brackets (Continued)

Note: The standard mounting for SAFPOWRBAR® conductor bars to assure proper clearance at endtrucks is to mount two bars on each side of the runway rail. For other than its standard location, and on low headroom cranes, or when more than four conductor bars are required on a runway, contact Gorbel® Customer Service for location data.

*For SL412 and SL416 endtrucks, the standard configuration is three bars on the inside of the runway and one bar on the outside.

- 8.5** Once the mounting brackets are secured, simultaneously mount the insulators to the conductor bar and mounting brackets. Loosen the screw in the insulator and lay the insulator over the top of the bars. Lift the bar and insulator to the level of the bracket and slide the insulator along the bar until it lines up with the bracket. Then fit the two nibs, on the upper ears of the insulator, into the holes provided for them in the bracket (**diagrams 8F** and **8G**). Make sure that the nibs are in the holes and the insulators are in the holes and the insulators are pressed firmly into the grooved parts of the SAFPOWRBAR® cover, and then tighten screw. Never force nibs into bracket or force the insulator over the conductor bar.



Diagram 8F.

Note: For illustrative purposes, only one conductor and insulator is shown. The conductor(s) nearest the beam web must be installed first to allow access to the screws to tighten down the insulator(s).



Diagram 8G.

- 8.6** Continue mounting all SAFPOWRBAR by repeating prior steps until the entire conductor bar system (mounting brackets, insulator, and conductor bar) is mounted to the runways. The ends of adjacent sections of conductor bar should be butted together. The joints should always be at least 6" away from an insulator to allow room for coupling cover.

Coupling Conductor Bars

Note: The insulating cover will be shipped cut back 2-1/8" from each end of the conductor. Each joint will therefore have a gap in the insulating cover of 4-1/4" allowing for the coupling. When conductor bars are cut to length in the field, the covering must be cut back 2-1/8" from the freshly cut end before coupling bars together.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Coupling Conductor Bars (Continued)

8.7 (See *diagram 8H* for complete assembly.) To couple bars together, pull the two ends to be joined apart and insert the coupling bar entirely into the upper opening of one bar. Allow the conductor bars to go back together and slide the coupling bar half way into the adjoining bar so that it is centered over the joint (*diagrams 8J* and *8K*).

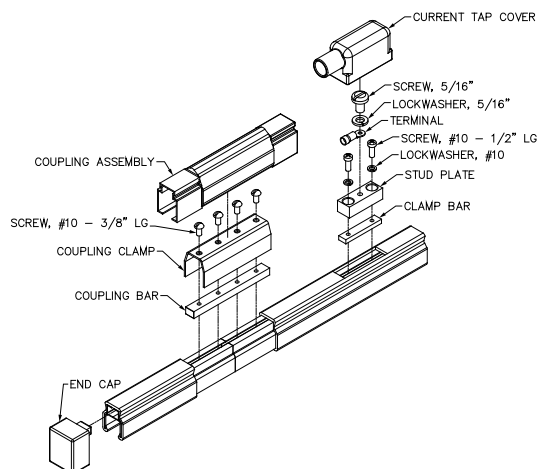


Diagram 8H.

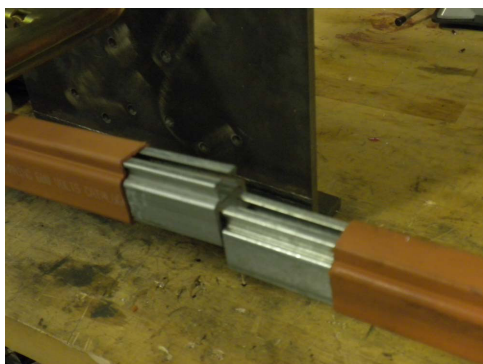


Diagram 8J.

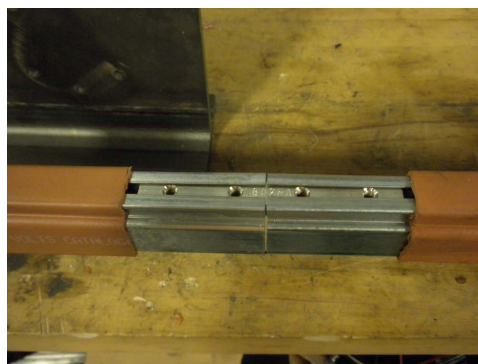


Diagram 8K.

8.8 Center the coupling clamp over the joint and tip to a 30-45 degree angle. Press one end over the bar (*diagrams 8L* and *8M*).



Diagram 8L.

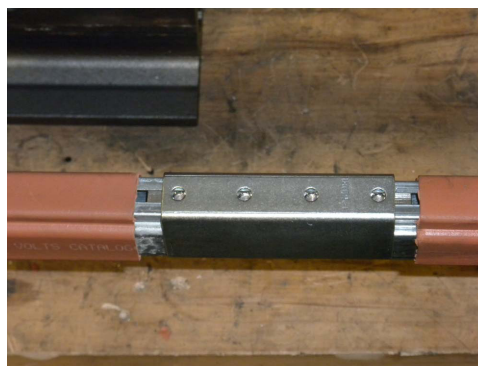


Diagram 8M.

WARNING

Do not spread clamp before installing, as clamp should be pressed onto bar.

8.9 Snap the coupling clamp down into place.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Coupling Conductor Bars (Continued)

- 8.10** Insert the provided screws through holes in the coupling clamp and into tapped holes in coupling bar and fully tighten (*diagram 8N*).
- 8.11** Pull back insulating cover on conductor bar 2-3 inches from the ends of the coupling clamp (*diagram 8P*).

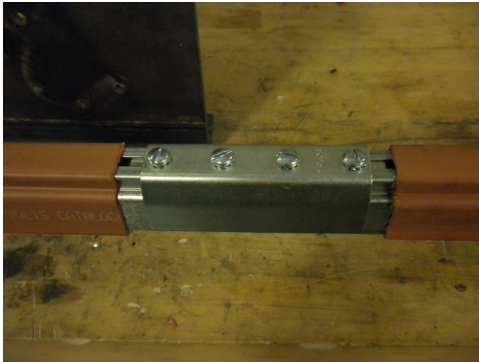


Diagram 8N.



Diagram 8P.

- 8.12** Place coupling cover over coupling clamp making sure the lips of the cover are firmly hooked over conductor bar legs (*diagram 8Q*).
- 8.13** Replace insulating covers on conductor bars that were pulled back in Step 12.11 covering the ends of the coupling cover (*diagram 8R*).

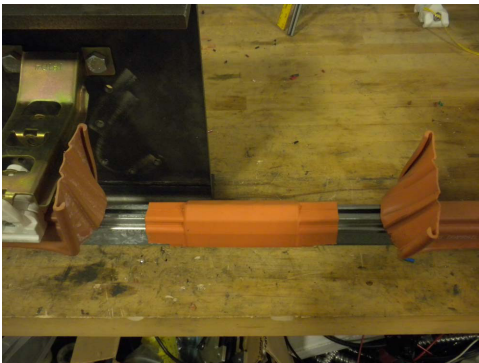


Diagram 8Q.

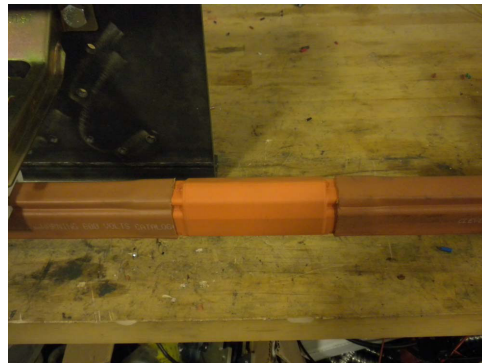


Diagram 8R.

Note: Splices may be located anywhere within the 66" between adjacent conductor mounting brackets. SAFPOWRBAR® splices may not be placed outside the last mounting bracket and thus cantilevering an entire section of bar.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Mounting Current Tap

- 8.14** One current tap is required for each continuous run of conductor bar. Determine the tap location and mark for a 2-1/4" cut on the conductor cover (**diagram 8S**).
- 8.15** Cut the cover at the tap location flush or slightly below the top of the conductor bar (**diagram 8T**).
- 8.16** Place the clamp plate in the upper slot of the conductor bar at a slight angle and spread the upper lips of the conductor bar slightly by wedging them apart with a flat-bladed screwdriver (or similar), allowing the clamp plate to slide into the upper slot (**diagram 8U**).

Note: If the tap is located close to a support, the insulator mounting hardware may have to be loosened in order to spread the upper lips of the conductor bar.



Diagram 8S.



Diagram 8T.



Diagram 8U.

- 8.17** Fasten the stud plate to the clamp plate with screws and lockwashers (**diagram 8V**).
- 8.18** Thread wire through terminal cover and crimp terminal to wire. The hole in the terminal must be at least 11/32" in diameter (wire and terminal not shown for clarity).
- 8.19** Attach terminal to stud plate and slide terminal cover over current tap forcing the arrow on cover into upper slot of conductor bar (**diagram 8W**).

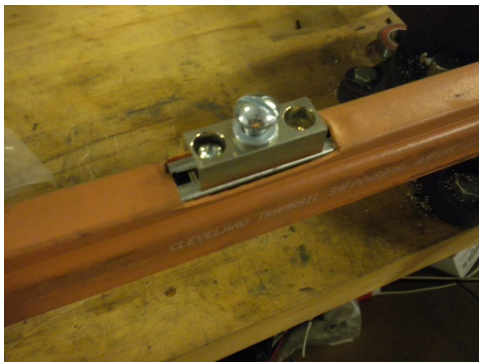


Diagram 8V.

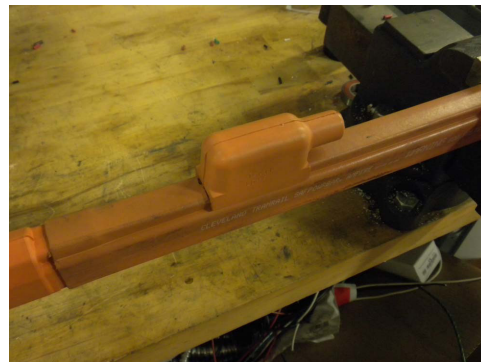


Diagram 8W.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Mounting End Cap

- 8.20** Ensure that the end of the cover is flush with the conductor bar. Press the end cap's rectangular boss in to the top channel of the conductor bar until the cap is seated against the end of the bar. The cover will need to be tucked into the end cap as it is slid on. A small rubber mallet may make the installation easier (*diagrams 8X* and *8Y*).



Diagram 8X.

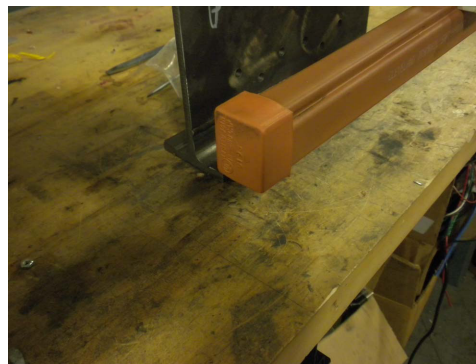


Diagram 8Y.

WARNING

Standard conductor bar lengths ship with 2-1/8" of exposed bar at each end. Any exposed bar at the end of a run must be cut off flush with the cover before installing end cap.

Installation of ST Collectors

- 8.21** ST collectors mount to drive idler heads with a steel rod that is bolted to the collector and slips into a bracket on the heads.

Note: Collectors must be installed "inboard" of the drive or idler heads so they ride on the conductor bar between the heads. For 2+2 conductor bar systems, one collector is mounted near each wheel. For 3+1 systems, two collectors mount near one of the wheels. The inner collector must ride in the inner conductor and the outer collector must ride in the outer conductor. The collector opposite this pair must ride in the middle conductor, with the single collector riding in the single conductor. Verify that the collectors do not interfere with each other. For other configurations, contact Customer Service for collector orientations.

- 8.22** Place shoe on split collector stem with "DOWN" marking in the down position on the stem. Ensure that the shoe is fully seated on the shoulder of the shaft and tighten the set screw to hold the shoe firmly in place (*diagram 8Z*).



Diagram 8Z.

STEP 8 - RUNWAY CONDUCTOR BAR INSTALLATION (SAFPOWRBAR®) (CONT.)

(for Safe-Lec Runway Conductor Bar Installation, go back to Step 7, page 12)

Installation of ST Collectors (Continued)

8.23 Unseat the lower edges of the conductor cover to allow the shoe to slip through (*diagram 8AA*). Twist shoe 150° so its long axis is parallel to the conductor bar. Press down on the collector, compressing it so the shoe is below the lower surface of the conductor bar (*diagram 8AB*). Rotate the collector so it is under the conductor bar and slowly release the collector so the shoe gently rests in the conductor bar. Check to ensure there is no binding and that the shoe is making firm contact with the conductor bar. Reseat the edges of the cover (*diagram 8AC*).



Diagram 8AA.



Diagram 8AB.

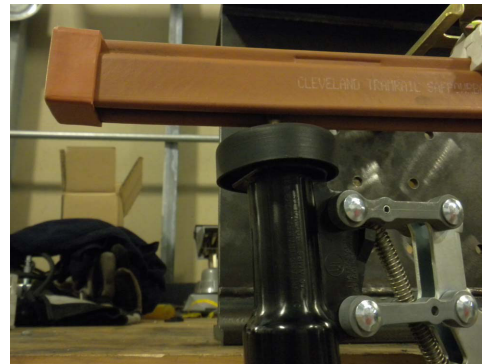


Diagram 8AC.

STEP 9 - FINAL STEPS

➤ **TIP:** Do not throw away this manual: the maintenance schedule is on the back cover. Keep Packing List, Installation Manual, General Arrangement Drawing, and any other inserts filed together in a safe place.

- 9.1 Be sure to sway brace the crane as required. Refer to Sway and Thrust Bracing Guidelines on page 23.
- 9.2 Verify that all bolts are tightened to specifications and lockwashers are compressed.
- 9.3 Be sure all endstops are installed and functional.
- 9.4 Verify that the power supply is in conformance with crane specifications as ordered.
- 9.5 Load test is required (by others). It should be performed per latest ANSI B30.11 specification.
- 9.6 If necessary, touch up crane with paint provided.

SWAY AND THRUST BRACING GUIDELINES

NOTE: SWAY BRACING BY OTHERS

WARNING

Bracing must be installed to resist damaging lateral and longitudinal loads.

Note: Bracing is supplied by others.

After flexibly suspended runway rail has been adjusted to its proper height and leveled, mechanical restrictions must be added to the system to limit the sway of the hanger rods. If the system were allowed to move excessively stresses would be created throughout the entire installation causing permanent damage to the components. This anti-sway bracing must be installed to limit the movement of the system both laterally and longitudinally.

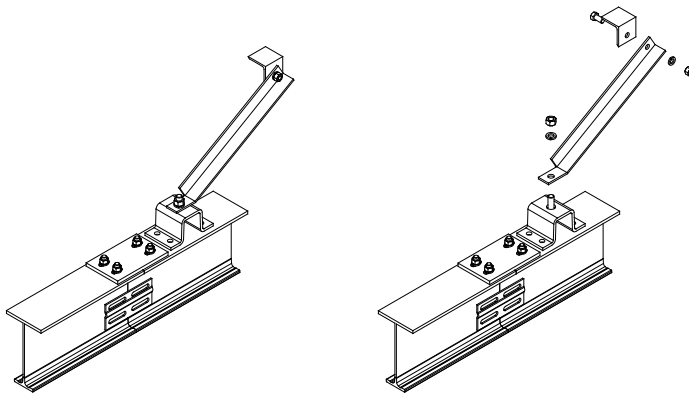
The function of the anti-sway bracing is solely to limit the movement of the material handling system. It cannot be used to force runways into alignment. All rails must be aligned and leveled before anti-sway bracing is installed. Also, the bracing cannot be allowed to carry any of the load supported by the hanger rods. The suspension system is designed to absorb the forces of movement and inertia. If these forces are allowed to act upon the sway bracing their full force will be transmitted to the building or superstructure.

Anti-sway bracing must be installed so that it does not interfere with or restrict the normal expansion or contraction of the system. Install the lateral braces at each suspension point. If the support center/top flange width ratio exceeds 40:1, additional lateral bracing is required.

Where the runways are suspended from a building with a sloping roof, the bracing must be attached to the runway having the shorter hanger rods. Lateral bracing should be no further than two flange widths from a hanger rod.

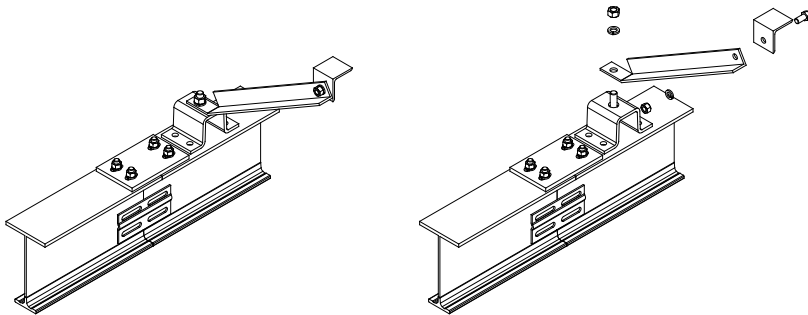
The lateral force on crane runways to provide for the effect of moving crane trolleys shall, if not otherwise specified, be 20 percent of the sum of the weights of the lifted load and of the crane trolley (but exclusive of other parts of the crane). The force shall be assumed to be applied at the bottom of the laterally braced runway, and shall be considered as acting in either direction normal to the runway rail.

The longitudinal force shall, if not otherwise specified, be taken as 10 percent of the maximum wheel loads of the crane applied at the bottom of rail.

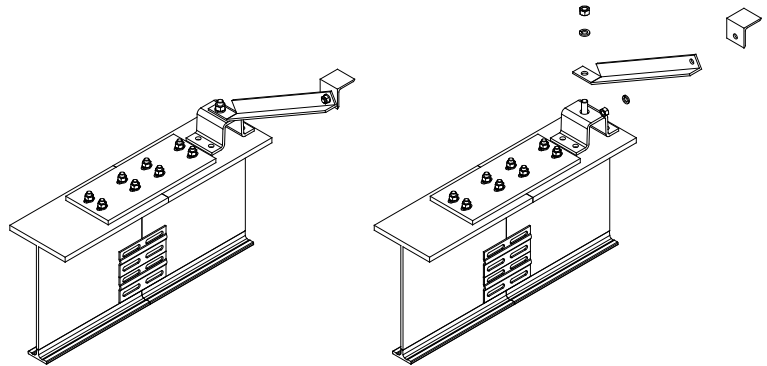


Longitudinal Bracing
(4200 - 4600 Tarca® beam)

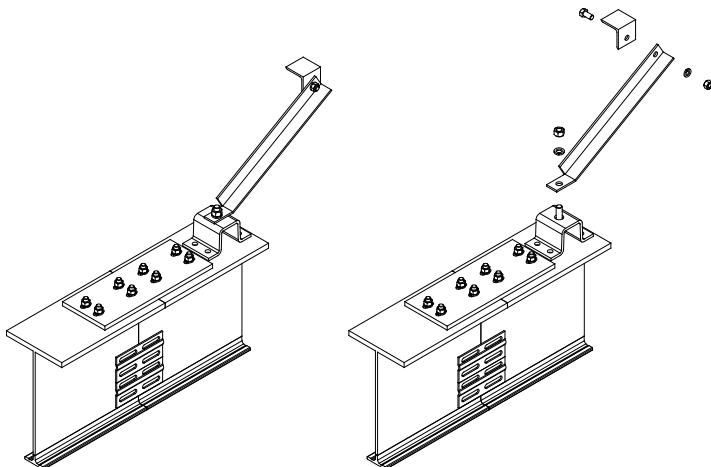
SWAY AND THRUST BRACING GUIDELINES (CONTINUED)



Lateral Bracing
(4200 - 4600 Tarca® beam)



Longitudinal Bracing
(5000 & larger Tarca® beam)



Lateral Bracing
(5000 & larger Tarca® beam)

CRANE OPERATOR INSTRUCTIONS

Overhead Patented Track cranes generally handle materials over working areas where there are personnel. Therefore, it is important for the Crane Operator to be instructed in the use of the crane and to understand the severe consequences of careless operation. It is not intended that these suggestions take precedence over existing plant safety rules and regulations or OSHA regulations. However, a thorough study of the following information should provide a better understanding of safe operation and afford a greater margin of safety for people and machinery on the plant floor. It must be recognized that these are suggestions for the Crane Operator's use. It is the responsibility of the owner to make personnel aware of all federal, state and local rules and codes, and to make certain operators are properly trained.

Qualifications

Crane operation, to be safe and efficient, requires skill: the exercise of extreme care and good judgement, alertness and concentration, and rigid adherence to proven safety rules and practices as outlined in applicable and current ANSI and OSHA safety standards. In general practice, no person should be permitted to operate a crane:

- Who cannot speak the appropriate language or read and understand the printed instructions.
- Who is not of legal age to operate this type of equipment.
- Whose hearing or eyesight is impaired (unless suitably corrected with good depth perception).
- Who may be suffering from heart or other ailments which might interfere with the operator's safe performance.
- Unless the operator has carefully read and studied this operation manual.
- Unless the operator has been properly instructed.
- Unless the operator has demonstrated his instructions through practical operation.
- Unless the operator is familiar with hitching equipment and safe hitching equipment practices.

Handling the Trolley Motion

Before a load is handled, the hoist should be positioned directly over the load that is to be handled. When the slack is taken out of the slings, if the hoist is not directly over the load, bring it directly over the load before hoisting is continued. Failure to center the hoist over the load may cause the load to swing upon lifting. Always start the trolley motion slowly and reduce the trolley speed gradually.

Handling the Hoist Motion

Refer to the lifting (hoist) equipment's operating instructions.

GENERAL SUGGESTIONS

Know Your Crane

Crane operators should be familiar with the principal parts of a crane and have a thorough knowledge of crane control functions and movements. The crane operator should be required to know the location and proper operation of the main conductor disconnecting means for all power to the attachments on the crane.

Responsibility

Each crane operator should be held directly responsible for the safe operation of the crane. Whenever there is any doubt as to SAFETY, the crane operator should stop the crane and refuse to handle loads until: (1) safety has been assured or (2) the operator has been ordered to proceed by the supervisor, who then assumes all responsibility for the SAFETY of the lift.

Do not permit **ANYONE** to ride on the hook or a load.

Inspection

Test the crane movement and any attachments on the crane at the beginning of each shift. Whenever the operator finds anything wrong or apparently wrong, the problem should be reported immediately to the proper supervisor and appropriate corrective action taken.

Operating Suggestions

One measure of a good crane operator is the smoothness of the crane operation. The good crane operator should know and follow these proven suggestions for safe, efficient crane handling.

1. The crane should be moved smoothly and gradually to avoid abrupt, jerky movements of the load. Slack must be removed from the sling and hoisting ropes before the load is lifted.
2. Center the crane over the load before starting the hoist to avoid swinging the load as the lift is started. Loads should not be swung by the crane to reach areas not under the crane.
3. Crane-hoisting ropes should be kept vertical. Cranes shall not be used for side pulls.
4. Be sure everyone in the immediate area is clear of the load and aware that a load is being moved.
5. Do not make lifts beyond the rated load capacity of the crane, sling chains, rope slings, etc.
6. Make certain that before moving the load, load slings, load chains, or other lifting devices are fully seated in the saddle of the hook with hook latch closed (if equipped with hook latch).
7. Check to be sure that the load and/or bottom block is lifted high enough to clear all obstructions when moving boom or trolley.
8. At no time should a load be left suspended from the crane unless the operator has the push button with the power on, and under this condition keep the load as close as possible to the floor to minimize the possibility of an injury if the load should drop. When the crane is holding a load, the crane operator should remain at the push button.
9. Do not lift loads with sling hooks hanging loose. If all sling hooks are not needed, they should be properly stored, or use a different sling.
10. All slings or cables should be removed from the crane hooks when not in use (dangling cables or hooks hung in sling rings can inadvertently snag other objects when the crane is moving).
11. Operators shall not carry loads and/or empty bottom blocks over personnel. Particular additional caution should be practiced when using magnet or vacuum devices. Loads, or parts of loads, held magnetically could drop. Failure of power to magnets or vacuum devices can result in dropping the load. Extra precaution should be exercised when handling molten metal in the proximity of personnel.
12. Whenever the operator leaves the crane the following procedure should be followed:
 - Raise all hooks to an intermediate position.
 - Spot the crane at an approved designated location.
 - Place all controls in the "off" position.
 - Open the main switch to the "off" position.
 - Make visual check before leaving the crane.
13. In case of emergency or during inspection, repairing, cleaning or lubrication, a warning sign or signal should be displayed and the main switch should be locked in the "off" position. This should be done whether the work is being done by the crane operator or by others.
14. Contact with rotation stops or trolley end stops shall be made with extreme caution. The operator should do so with particular care for the safety of persons below the crane, and only after making certain that any persons on the other cranes are aware of what is being done.
15. ANY SAFETY FEATURES AND MECHANISMS BUILT IN OR OTHERWISE PROVIDED WITH THE CRANE BY CLEVELAND TRAMRAIL ARE REQUIRED FOR THE SAFE OPERATION OF THE CRANE. DO NOT, UNDER ANY CIRCUMSTANCES, REMOVE OR OTHERWISE IMPAIR OR DISABLE THE PROPER FUNCTIONING OF ANY CRANE SAFETY MECHANISMS OR FEATURES BUILT-IN OR OTHERWISE PROVIDED BY CLEVELAND TRAMRAIL FOR SAFE OPERATION OF THE CRANE. ANY REMOVAL, IMPAIRMENT OR DISABLING OF ANY SUCH SAFETY MECHANISMS OR FEATURES OR OTHER USE OR OPERATION OF THE CRANE WITHOUT THE COMPLETE AND PROPER FUNCTIONING OF ANY SUCH SAFETY MECHANISMS OR FEATURES AUTOMATICALLY AND IMMEDIATELY voids ANY AND ALL EXPRESS AND IMPLIED WARRANTIES OF ANY KIND OR NATURE.

LIMITED WARRANTY

It is agreed that the equipment purchased hereunder is subject to the following LIMITED warranty and no other. Gorbel warrants the manual or motorized Patented Track Crane products to be free from defects in material or workmanship for a period of two years or 4,000 hours use from date of shipment in class C service. This warranty shall not cover failure or defective operation caused by operation in excess of recommended capacities, misuses, negligence or accident, and alteration or repair not authorized by Gorbel. No system shall be field modified after manufacture without the written authorization of Gorbel, Inc. Any field modification made to the system without the written authorization of Gorbel, Inc. shall void Gorbel's warranty obligation. OTHER THAN AS SET FORTH HEREIN, NO OTHER EXPRESS WARRANTIES, AND NO IMPLIED WARRANTIES, ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE BY GORBEL WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED. GORBEL SHALL NOT BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES WHATSOEVER, WHETHER OR NOT FORESEEABLE, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOST PROFITS AND ALL SUCH INCIDENTAL, SPECIAL AND/OR CONSEQUENTIAL DAMAGES ARE HEREBY ALSO SPECIFICALLY DISCLAIMED. Gorbel's obligation and Purchaser's or end user's sole remedy under this warranty is limited to the replacement or repair of Gorbel's products at the factory, or at the discretion of Gorbel, at a location designated by Gorbel. Purchaser or end user shall be solely responsible for all freight and transportation costs incurred in connection with any warranty work provided by Gorbel hereunder. Gorbel will not be liable for any loss, injury or damage to persons or property, nor for damages of any kind resulting from failure or defective operation of any materials or equipment furnished hereunder. Components and accessories not manufactured by Gorbel are not included in this warranty. Purchaser's or end user's remedy for components and accessories not manufactured by Gorbel is limited to and determined by the terms and conditions of the warranty provided by the respective manufacturers of such components and accessories.

A) DISCLAIMER OF IMPLIED WARRANTY OF MERCHANTABILITY

Gorbel and Purchaser agree that the implied warranty of merchantability is excluded from this transaction and shall not apply to the goods involved in this transaction.

B) DISCLAIMER OF IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE

Gorbel and Purchaser agree that the implied warranty of fitness for particular purpose is excluded from this transaction and shall not apply to the goods involved in this transaction.

C) DISCLAIMER OF EXPRESS WARRANTY

Gorbel's agents, or dealer's agents, or distributor's agents may have made oral statements about the machinery and equipment described in this transaction. Such statements do not constitute warranties, and Purchaser agrees not to rely on such statements. Purchaser also agrees that such statements are not part of this transaction.

D) DISCLAIMER OF SPECIAL, INCIDENTAL AND CONSEQUENTIAL DAMAGES

Gorbel and Purchaser agree that any claim made by Purchaser which is inconsistent with Gorbel's obligations and the warranty remedies provided with Gorbel's products, and in particular, special, incidental and consequential damages, are expressly excluded.

E) DEALER OR DISTRIBUTOR NOT AN AGENT

Gorbel and Purchaser agree that Purchaser has been put on notice that dealer or distributor is not Gorbel's agent in any respect for any reason. Gorbel and Purchaser also agree that Purchaser has been put on notice that dealer or distributor is not authorized to incur any obligations or to make any representations or warranties on Gorbel's behalf other than those specifically set forth in Gorbel's warranty provided in connection with its product.

F) MERGER

This warranty agreement constitutes a final and complete written expression of all the terms and conditions of this warranty and is a complete and exclusive statement of those terms.

G) PAINTING

Every crane (excluding components) receives a quality paint job before leaving the factory. Unfortunately, no paint will protect against the abuses received during the transportation process via common carrier. We have included at least one (1) twelve ounce spray can for touchup with each crane ordered (unless special paint was specified). If additional paint is required, contact a Gorbel® Customer Service Representative at 1-800-821-0086 or 1-585-924-6262.

Title and Ownership:

Title to the machinery and equipment described in the foregoing proposal shall remain with Gorbel and shall not pass to the Purchaser until the full amount hereof agreed to be paid has been fully paid in cash.

Claims and Damages:

Unless expressly stated in writing, goods and equipment shall be at Purchaser's risk on and after Seller's delivery in good shipping order to the Carrier. Gorbel shall in no event be held responsible for materials furnished or work performed by any person other than it or its authorized representative or agent.

Cancellations:

If it becomes necessary for the purchaser to cancel this order wholly or in part, he shall at once so advise Gorbel in writing. Upon receipt of such written notice all work will stop immediately. If the order entails only stock items, a flat restocking charge of 15% of the purchase price will become due and payable by Purchaser to Gorbel. Items purchased specifically for the canceled order shall be charged for in accordance with the cancellation charges of our supplier plus 15% for handling in our factory. The cost of material and/or labor expended in general fabrication for the order shall be charged for on the basis of total costs to Gorbel up to the time of cancellation plus 15%.

Returns:

No equipment, materials or parts may be returned to Gorbel without express permission in writing to do so.

Extra Charge Delay: If Purchaser delays or interrupts progress of Seller's performance, or causes changes to be made, Purchaser agrees to reimburse Gorbel for expense, if any, incident to such delay.

Changes and Alterations:

Gorbel reserves the right to make changes in the details of construction of the equipment, as in its judgment, will be in the interest of the Purchaser; will make any changes in or additions to the equipment which may be agreed upon in writing by the Purchaser; and Gorbel is not obligated to make such changes in products previously sold any customer.

Third Party Action:

Should Gorbel have to resort to third party action to collect any amount due after thirty (30) days from date of invoice, the Purchaser agrees to pay collection costs, reasonable attorney's fees, court costs and legal interest.

OSHA Responsibilities:

Gorbel agrees to fully cooperate with Purchaser in the design, manufacture or procurement of safety features or devices that comply with OSHA regulations. In the event additional equipment or labor shall be furnished by Gorbel, it will be at prices and standard rates then in effect, or as may be mutually agreed upon at the time of the additional installation.

Equal Employment Opportunity:

Gorbel agrees to take affirmative action to ensure equal employment opportunity for all job applicants and employees without regard to race, color, age, religion, sex, national origin, handicap, veteran, or marital status. Gorbel agrees to maintain non-segregated work facilities and comply with rules and regulations of the Secretary of Labor or as otherwise provided by law or Executive Order.

PERIODIC INSPECTION AND LUBRICATION RECOMMENDATIONS

The following is a checklist to be followed in performing periodic inspections and preventative maintenance on Gorbel® Tarca® Systems. It is intended that this checklist be supplemented with any additional instruction sheets and maintenance manuals sent with each job.

The frequency of inspection and lubrication recommendations presented herein is based upon normal operating conditions of one complete handling cycle every 10 minutes throughout a 40-hour week. If the actual duty cycle of a particular unit is greater or less than this, the inspections and lubrications should be performed more frequently or less frequently in proportion.

Each industry has conditions peculiar to it, which may cause wear of certain parts. The tabulation given is only general and may be supplemented by an individual maintenance department program to meet its own particular requirements. Particular attention should be given to corrosive conditions, excessive vibrations, extreme ambient temperature variations, and rough handling conditions.

Questions regarding damaged, worn or cracked equipment components should be directed to the Gorbel® Customer Services Department at 800-821-0086 or 585-924-6262.

The recommendations contained herein are to be supplemented by any vendor instructions, which are included in this manual.

WARNING: Power should be off and locked when performing maintenance on any part of the system.

* State and local codes may require inspection and maintenance checks more often. Please check the state and local code manuals in your area.

TRACKS, RUNWAYS & HANGERS

ITEM	COMPONENT	MAINTENANCE	FREQUENCY
1	Top Hanger Bracket/ Beam Clips/ Threaded Rod	Check that lock washers are compressed and nuts tightened to manufacturer's specifications.	Every 1,000 hours or 6 months
2	Lower Hanger Bracket	Check that lock washers are compressed and nuts tightened to manufacturer's specifications.	Every 1,000 hours or 6 months
3	Sway Brace Connection	Check for loose bolts & cracked fittings.	Every 1,000 hours or 6 months
4	Track	Check for rail wear (replace if raised portion of tread is gone). Check welds for incipient cracks. Check underside of rail for wear from drive rollers if using tractor drives. When groove is 1/8" deep, replace track. Check side of rail for wear. When width has decreased more than 1/8", replace track.	Every 2,000 hours or yearly
5	Joints	Check for loose or worn hardware or if welded type, for incipient cracks. Check for track alignment and that wheel rolling surface is flush.	Every 2,000 hours or yearly
6	End Stops	Check for loose bolts and for incipient cracks.	Every 2,000 hours or yearly
7	Paint	Clean periodically and repaint where corrosion is present.	Every 2,000 hours or yearly

TROLLEY & CARRIERS

ITEM	COMPONENT	MAINTENANCE	FREQUENCY
1	Structural Frame & Load Bars	Check for incipient cracks in welds and castings. Check for loose bolts.	Every 2,000 hours or yearly
2	Eye Bolts, Suspension Pins & Ball Joint Rocker Assembly	Check for loose or missing set screws or lock pins. Grease spherical bearing housing monthly through grease fitting or repack with clean grease at three (3) month intervals. Use Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal). Check for cracks and excessive wear. Note: When lubricating through grease fitting or repacking, suspension pins and ball joint rocker assembly should be raised approximately 1/4".	Every 150 hours or 1 month
3	Wheels & Guide Rollers	Check for loose wheel bearings. Check wheels for proper contact and tracking on rail. Check wheel diameter for wear (replace when 1/4" under original diameter). Check axle nuts for tightness. Lubricate using Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal).	Every 500 hours or 3 months
4	Geared Drive	Check oil level. Change oil as ambient temperature requires (see Lube List). Check gear wear through backlash. Check for worn bearings (excessive noise). Check for loose bolts in gear case cover.	Every 750 hours or 4 months
5	Belt Drive	Check for belt wear	Every 750 hours or 4 months
6	Motors	Check motor after active use for excessive heat (130° C or 226° F max. with class "B" insulation). Check motor bearings and oil seals. Tighten loose bolts. Blow out dust. Lubricate. Also see motor manufacturer's recommendations.	Every 1,000 hours or 6 months
7	Control	Check for burned contacts. Check mechanical latch devices for wear and freedom of movement. Check for loose connections.	Every 1,000 hours or 6 months
8	Electric Brakes (Disc)	Adjust air gap for wear. Check lining thickness. Check for broken shading coils. Check rotating disc at spline for excessive wear. See manufacturer's recommendations.	Every 750 hours or 4 months
9	Head	Check for thrust washer wear and integrity.	Every 1,000 hours or 6 months

SAFE-LEC CONDUCTOR BAR

ITEM	COMPONENT	MAINTENANCE	FREQUENCY
1	Collectors	Contact shoes should be checked for wear. Check alignment of collector to conductor bar. Base of collector should be directly inline with associated conductor. Check collector pivot pins are free from any contamination. Uneven shoe wear indicates less than optimal collector alignment.	Every 150 hours or 1 month
2	Bar Covering	Check to ensure no damage is visible.	Every 2,000 hours or yearly
3	Complete System	In environments that are subject to considerable build up of dust, especially conductive dust, remove this dust by brushing.	Every 2,000 hours or yearly

SAFPOWRBAR® CONDUCTOR BAR

ITEM	COMPONENT	MAINTENANCE	FREQUENCY
1	Bar	Check for corrosion, bowing, or sagging. Check alignment at moving gaps. Realign if necessary.	Every 2,000 hours or yearly
2	Couplings	Check bolt or screw tightness. Check for corroded contact surfaces.	Every 2,000 hours or yearly
3	Supports	Check for loose bolts and/or screws and bent brackets.	Every 2,000 hours or yearly
4	Insulators	Check for loose bolts, sheared support ears, current carrying deposits on surface.	Every 2,000 hours or yearly
5	Bar Covering	Check for accidental abrasion and peeled covering.	Every 2,000 hours or yearly
6	Current Taps	Check bolt and terminal screw tightness. Check for corroded contact surface.	Every 2,000 hours or yearly
7	Grounds	Check for ground continuity. Check at load side of disconnect switch (current off), with meg-ohm tester, for overall system insulation resistance.	Every 2,000 hours or yearly
8	Collectors	Check for worn shoes. Check flexible leads from wheel clevis pigtail or slide shoe shaft. Check tightness of lead connections. Check for cracked insulators. On type "ST" collectors, check for free movement or pantograph. Lubricate pivot pins as required. Collector bracket tubes should be vertical within 1/16". Replace if necessary.	Every 750 hours or 4 months

HOIST (Refer to Hoist Manufacturer)

C-TRACK

ITEM	COMPONENT	MAINTENANCE	FREQUENCY
1	Trolleys	All trolleys are lubricated and sealed for life, therefore no regreasing is required.	
2	Rollers	Check all rollers for wear.	Every 2,000 hours or yearly
3	Hardware	Check tightness (see torque specifications). Check cable clamps on all trolleys, making sure cables remain secure.	Every 2,000 hours or yearly
4	C-Track	Check channel for wear. Clear the running surface of any debris.	Every 2,000 hours or yearly
5	Cables	Inspect cables for any cuts or cracks.	Every 2,000 hours or yearly

RECOMMENDED LUBRICANT LIST

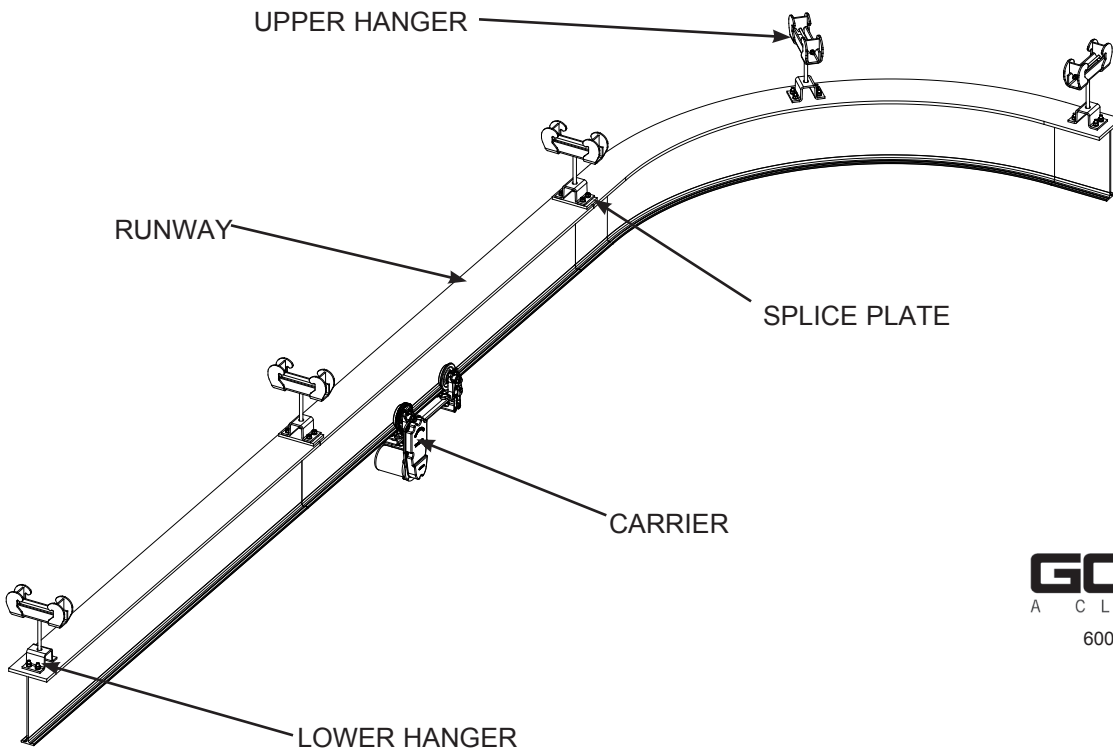
Bushings and thrust washers without grease fitting, spray lube or general purpose oil.
 Bushings and thrust washers with grease fittings:

Multi-purpose application and high temperature application:
 Bentone grease type, NLGI Grade 1 (Lubriplate Brand 930-AA or equal).

Ball or roller bearings through alemite fittings:
 Multi-purpose application and high temperature application:
 Bentone grease type, NLGI Grade 1 (Lubriplate Brand 930-AA or equal).

Series "W" motor heads Straight mineral oil - SAE-50
 Type "MT" & "CH" tractors..... Straight mineral oil - SAE-50
 Compact drives ("L")..... A.G.M.A. #8 compound

NOTE: When above equipment is used outdoors, we recommend a field change in oil (in some cases as low as SAE-10), when cold weather arrives. Consult local lubrication engineer for recommended greases in acid fume atmosphere.



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