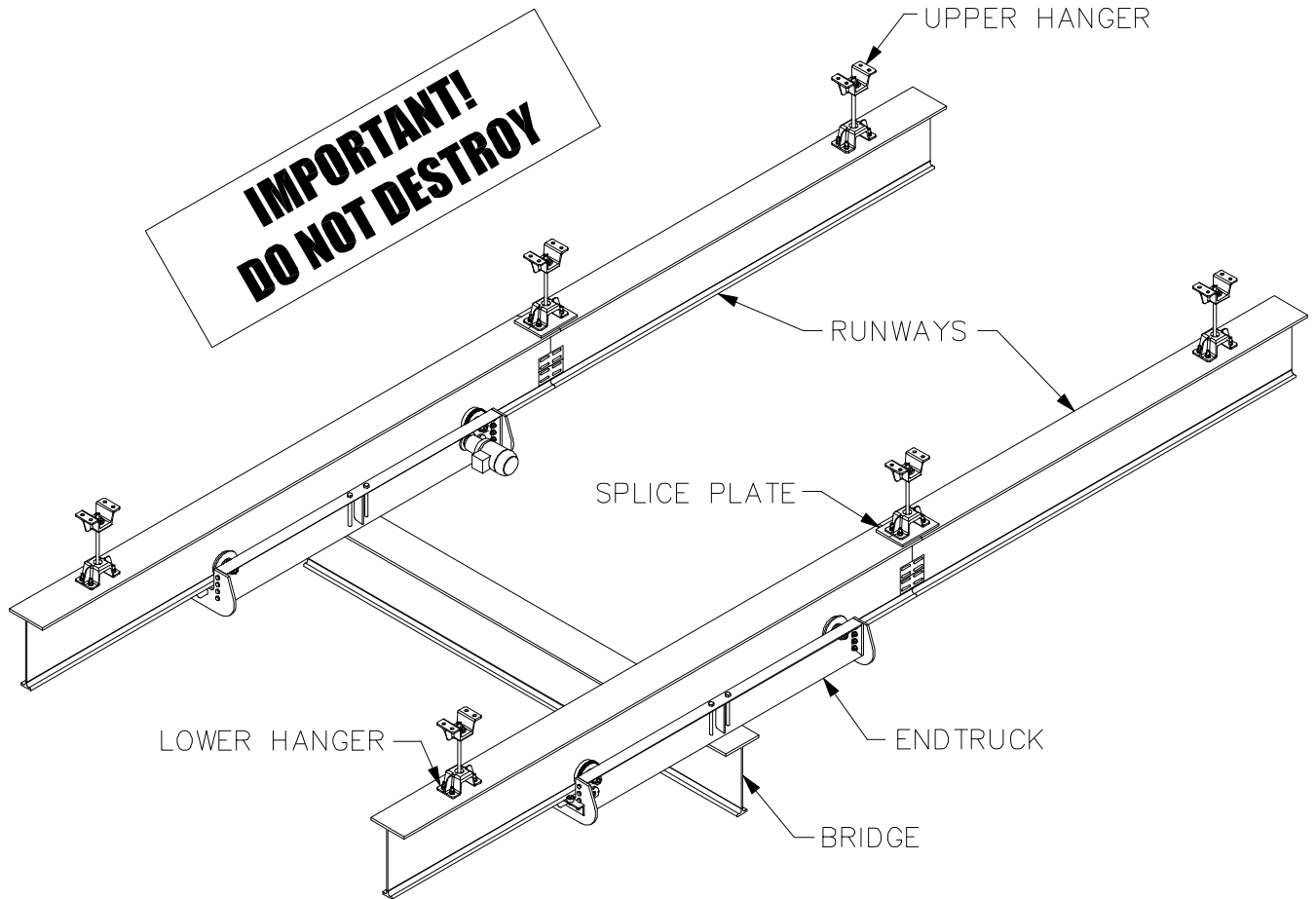


Installation, Operation, & Maintenance Manual



Ceiling Mounted
Patented Track
Bridge Crane

Cleveland Tramrail™ Dealer _____

Cleveland Tramrail™ Customer Order No. _____

Date _____
Month Year

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

INTRODUCTION

Thank you for choosing Cleveland Tramrail™ Patented Track cranes to solve your material handling needs. The innovative design and heavy-duty construction of the Cleveland Tramrail™ Patented Track cranes 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. Cleveland Tramrail™ Cranes will provide many years of dependable service by following the installation and maintenance procedures described herein.

Underhung cranes 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
- Making sure that festooning cannot be snagged or pinched, whether it is electric or pneumatic

For additional safety precautions, see page 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

It is recommended that Crane not be used as a ground: A separate ground wire should be utilized. For example, systems with 3-phase power require three conductors plus one ground wire.

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 22-23.

WARNING

Reference the American Institute of Steel Construction (AISC) Manual of Steel Construction (9th edition), Part 5, Specification for Structural Joints using ASTM A325 or A490 Bolts (section 8.d.2) for the proper procedures to follow when using any torque-tightening method.

INSTALLATION

STEP 1 - PRE-ASSEMBLY

➡ **TIP:** Packing list can be found in plastic pocket attached to hardware box: General Arrangement Drawing and additional inserts can be found enclosed in this installation manual.

- 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 Cleveland Tramrail™ dealer.
- 1.5 Tools and materials typically needed to assemble crane are as follows:
 - Hand tools
 - Leveling tools
 - Ladders/man lifts
 - Welding equipment capable of welding to AWS specification D1.1 using E70xx electrodes.
 - Powered metal-cutting saw
 - Steel shims
 - Torque wrench

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 24.
- 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, 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.

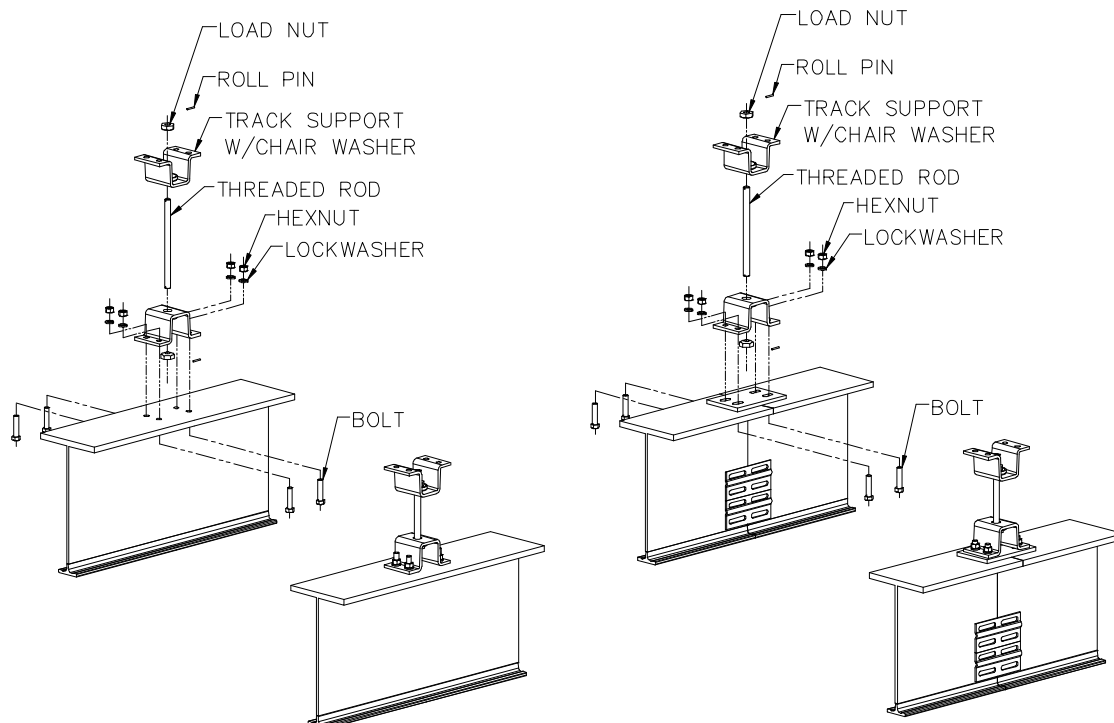


Diagram 2A. Single Rod Hanger Assembly
(3/4" - 1" Diameter Rod).

STEP 2 - HANGER INSTALLATION (CONTINUED)

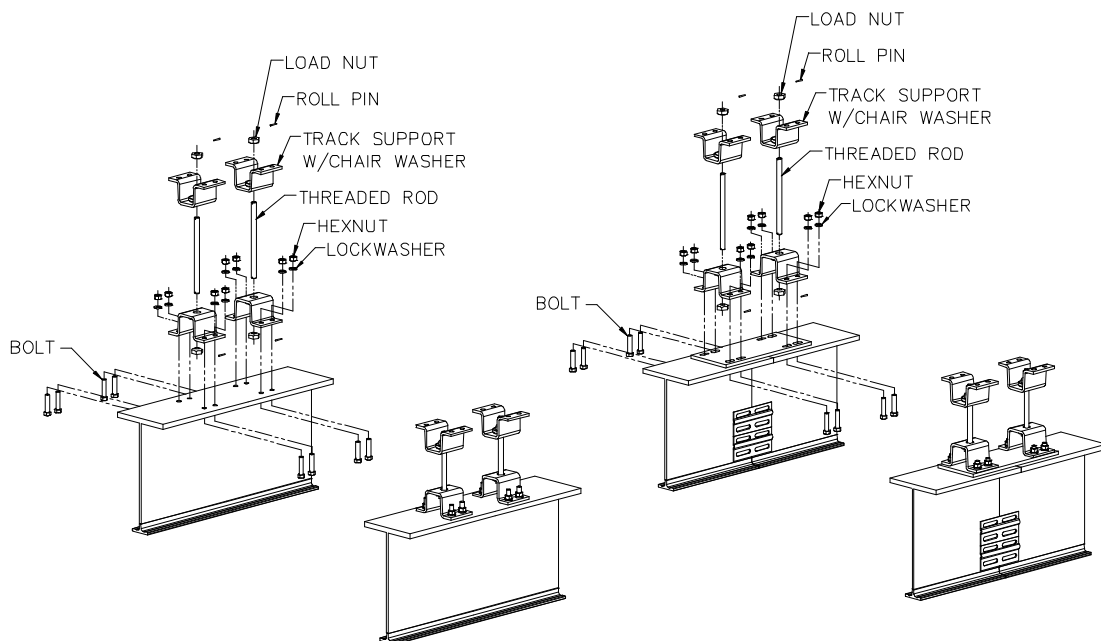


Diagram 2B. *Double Rod Hanger Assembly
(3/4" - 1" Diameter Rod).*

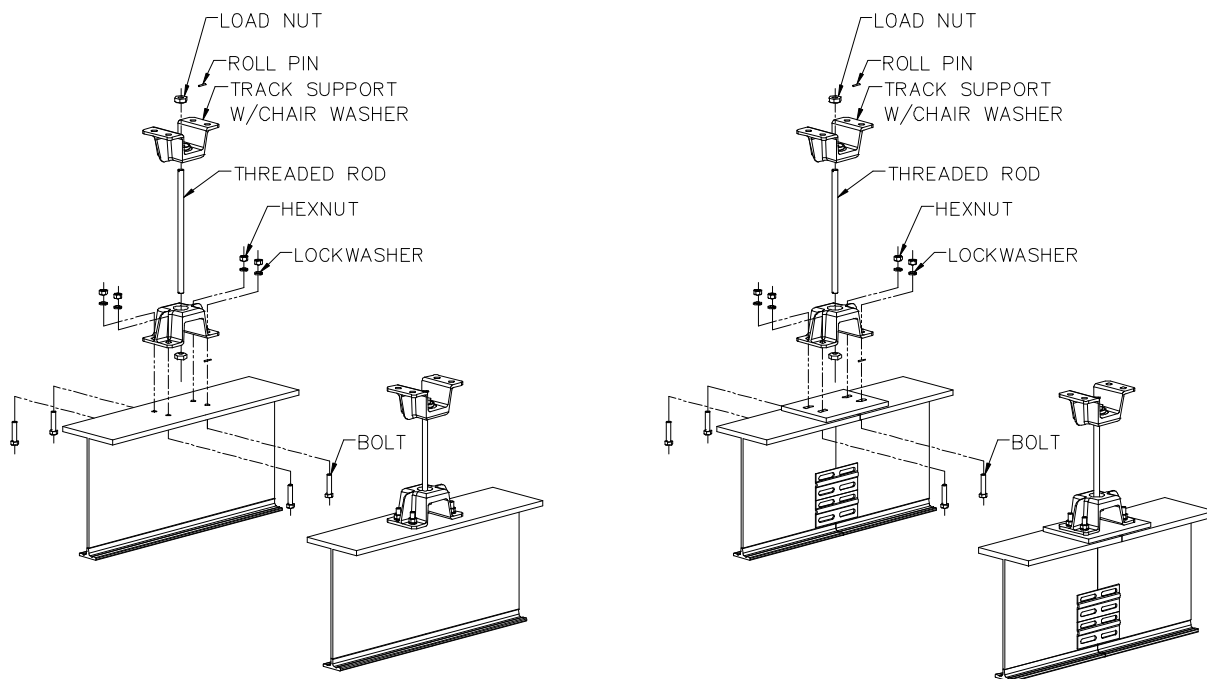


Diagram 2C. *Single Rod Hanger Assembly
(1 1/4" Diameter Rod).*

STEP 2 - HANGER INSTALLATION (CONTINUED)

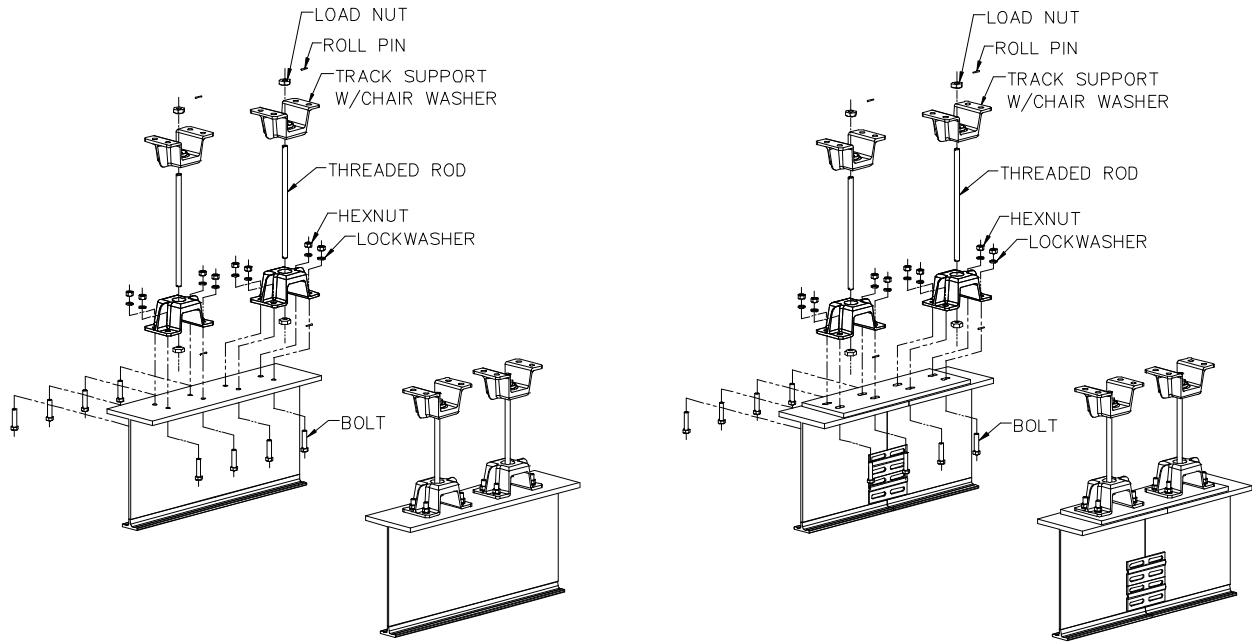


Diagram 2D. Double Rod Hanger Assembly
(1 1/4" Diameter Rod).

STEP 3 - RUNWAY AND BRIDGE END STOP INSTALLATION

- 3.1 End stops are required and must be installed at the ends of the carrier or trolley travel and at the end of crane travel on runways.
- 3.2 The standard end stops are for normal applications where contacts with end stops are infrequent and travel is at slow speed (*diagram 3A*).
- 3.3 When service conditions are such that the carrier, trolley, or crane 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 details contact our Customer Service Department.

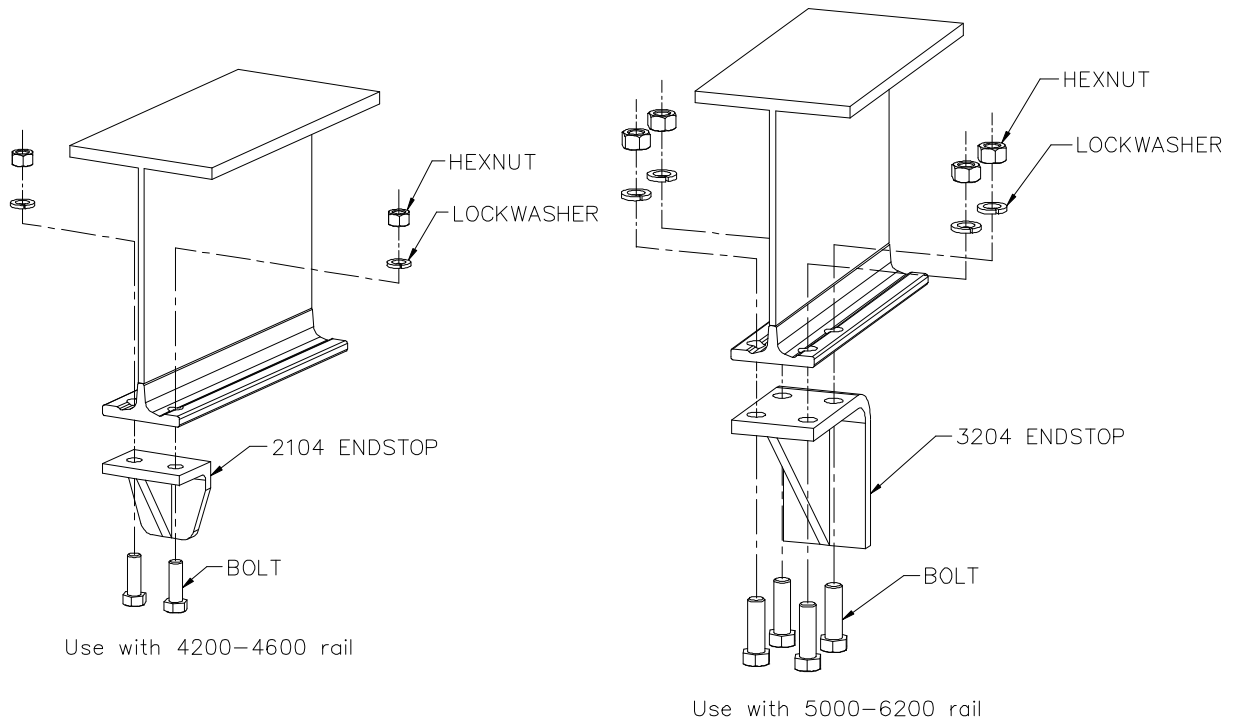


Diagram 3A. End stop.

STEP 4 - SPLICE JOINT INSTALLATION

Reference the General Arrangement Drawing for web plate locations.

4.1 Bring the ends of the track sections together as close as possible (*diagram 4A or 4B*).

4.2 Align holes in top flange splice plate to holes going through the top of the flange in rail. Clamp into place prior to welding. See page 8 for splice plate welding instructions. If top flange splice plate is to be bolted, align plate with holes in each track section. Tighten clamping bolts along top of splice plate to help align top flange portion of track sections.

4.3 Place a web splice plate(s) on each side of web section. Align plate as shown (*diagram 4A or 4B*).

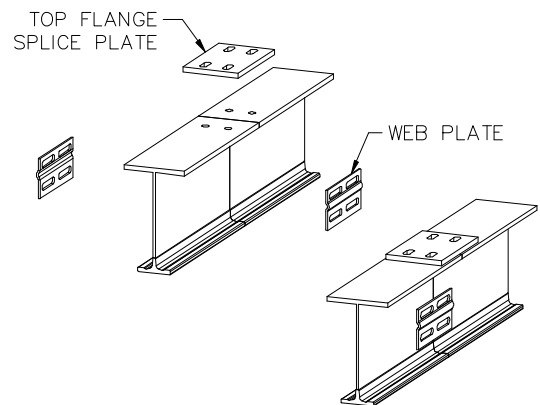


Diagram 4A. Splicing rail
(4200 - 4600 Tarca™ beam).

WARNING

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

- 4.4** Plate to be welded in accordance with American Welding Society (AWS) specification D1.1 using E70xx electrodes.
- 4.5** Attach runway to upper hanger by repeating Steps 2.2 through 2.4, on page 3.
- 4.6** Check to see that the transition from one track to the other is smooth: no raised areas to inhibit carrier or end truck operation.
- 4.7** For additional runways repeat Steps 4.1 through 4.7.
- 4.8** Install end stops (Step 3, on page 6).

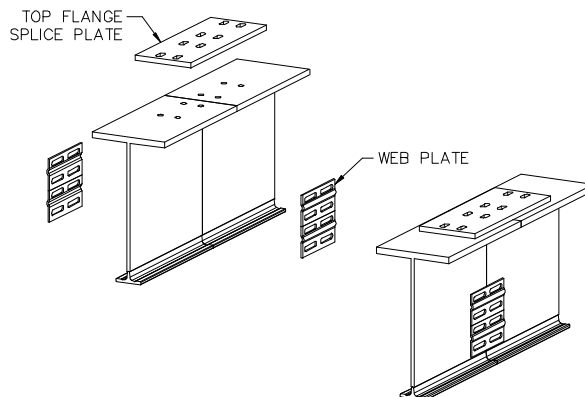
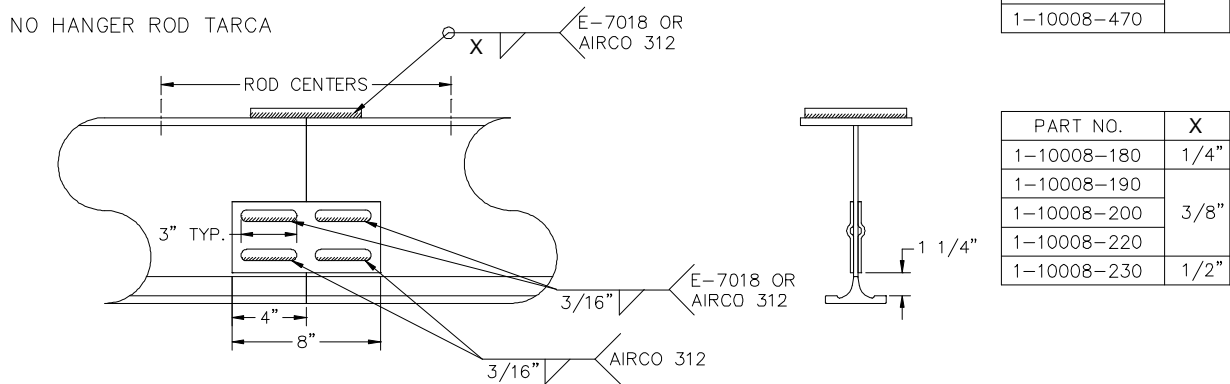
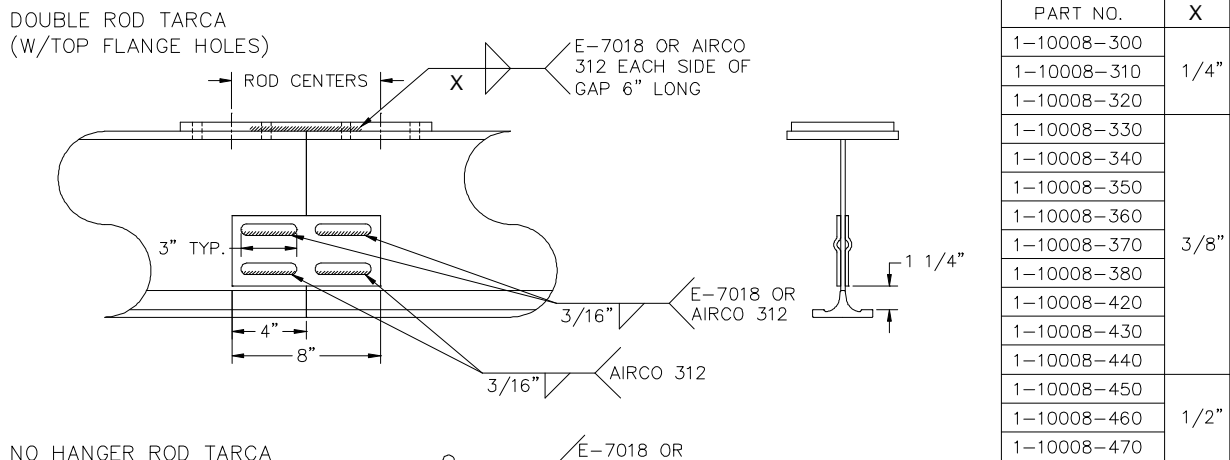
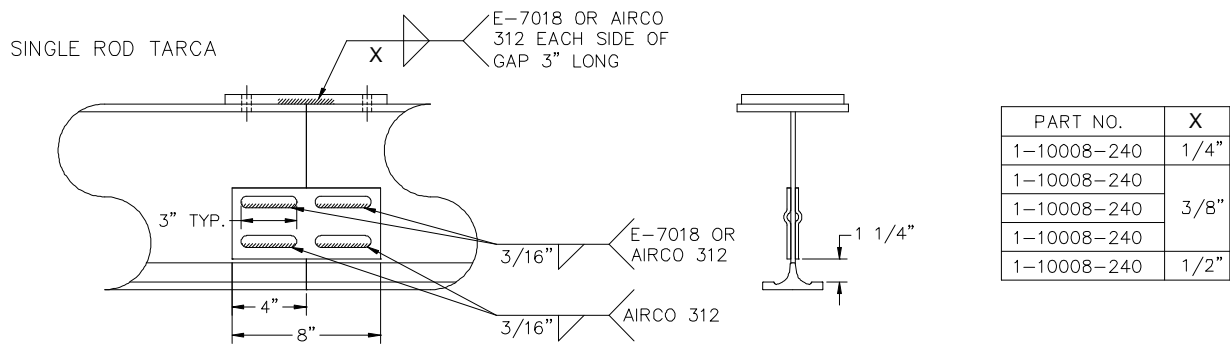


Diagram 4B. Splicing rail
(5000 & larger Tarca™ beam).

STEP 4 - SPLICE JOINT INSTALLATION (CONTINUED)



WEB COUPLING PLATE (P/N: 1-32093-000)

- * (1) REQ'D EACH SIDE ON 4200-4600 TARCA BEAM (SHOWN ABOVE)
- * (2) REQ'D EACH SIDE ON 5000 & LARGER TARCA BEAM (SHOWN BELOW)

(TYPICAL ALL ASSEMBLIES)

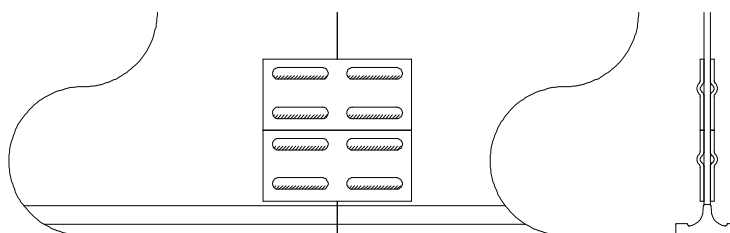
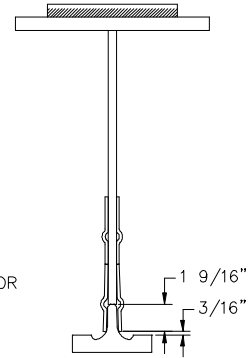
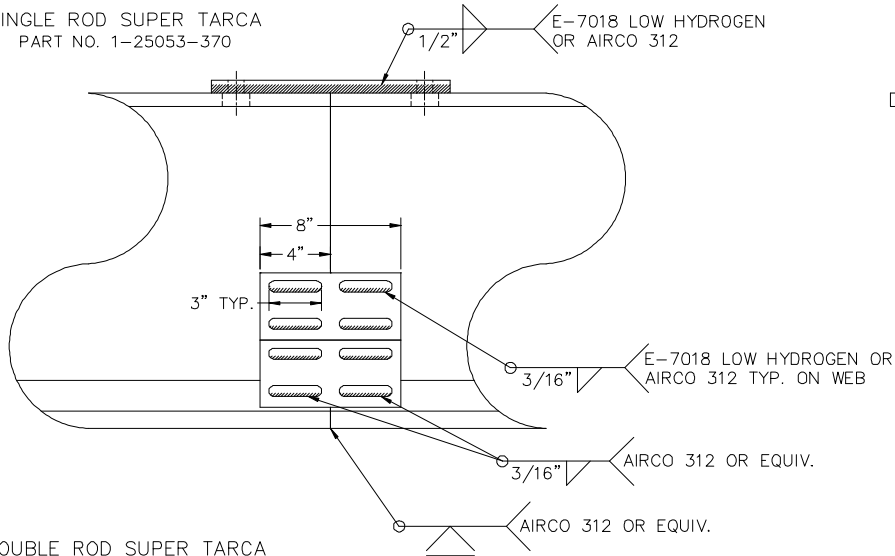


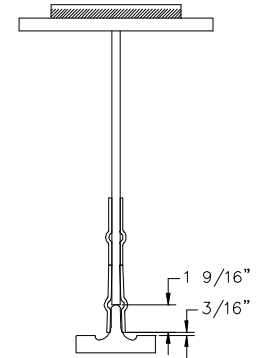
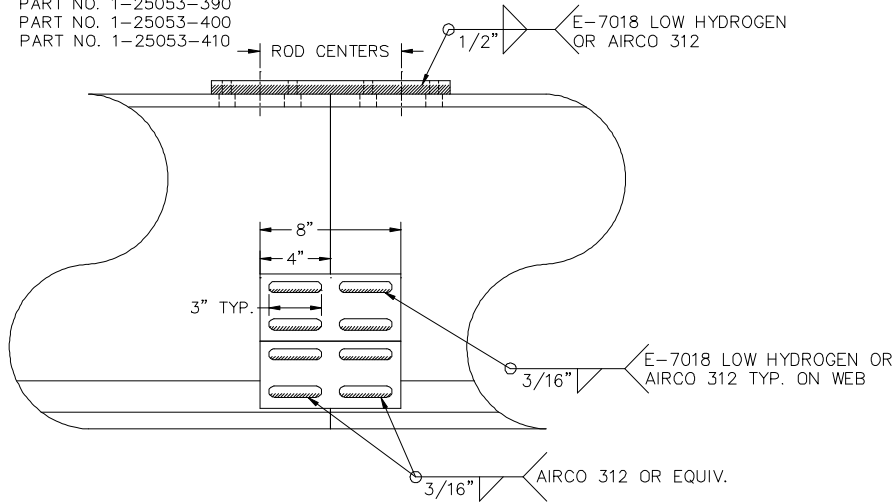
Diagram 4C.

STEP 4 - SPLICE JOINT INSTALLATION (CONTINUED)

SINGLE ROD SUPER TARCA
PART NO. 1-25053-370



DOUBLE ROD SUPER TARCA
(W/TOP FLANGE HOLES)
PART NO. 1-25053-390
PART NO. 1-25053-400
PART NO. 1-25053-410



DOUBLE ROD SUPER TARCA
(W/OUT TOP FLANGE HOLES)
PART NO. 1-25053-380

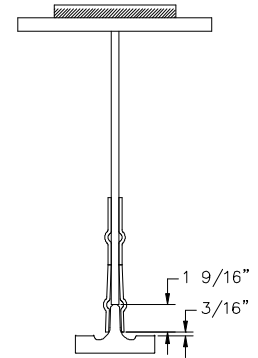
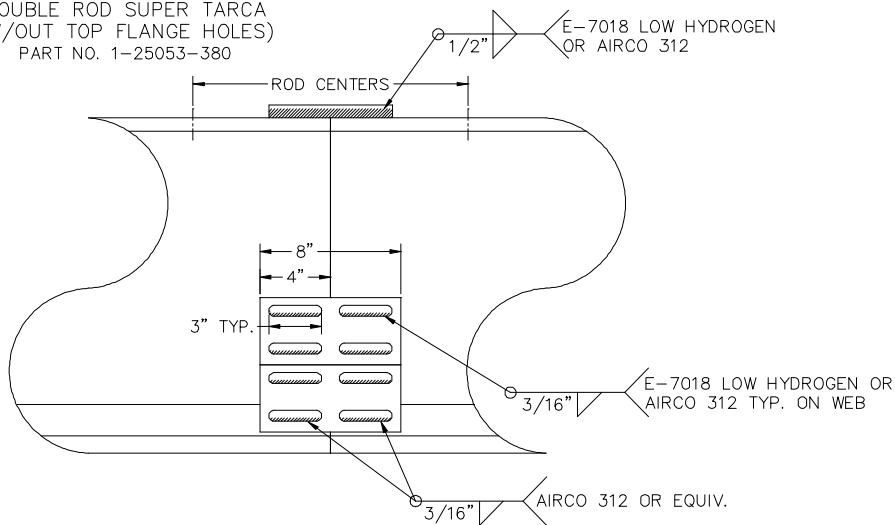


Diagram 4D.

STEP 5 - BRIDGE AND END TRUCK INSTALLATION

FIRST STEPS:

- 5.1 Make sure all runway end stops have been properly installed.
- 5.2 Prior to adding bridge, wipe rail tread with a clean, dry cloth to remove grit or debris that may have collected during shipping, storage, or installation.

If customer is supplying bridge, go to Step 5.3. If end trucks and bridge are ordered together, start at Step 5.10, page 11.

- 5.3 Lay bridge girder on floor. Stabilize the girder so that it cannot tip over.
- 5.4 Place end trucks on top flange of girder and orient them so that the motors will be in the desired location (**Diagram 5A** - solid lines indicate standard motor position). Center the end truck to bridge connection bolt pattern on the girder. Make sure that the bridge span exactly matches the distance between runway centerlines. Also confirm that the end trucks are square to the girder by matching diagonal measurements.
- 5.5 Transpose the bolt pattern from end truck to bridge girder. Match mark end trucks and bridge.
- 5.6 Drill bolt holes ($\text{Ø } 49/64''$).
- 5.7 Bolt end trucks into place. Confirm that the bridge span is correct and end trucks are square.
- 5.8 Weld squaring blocks into place according to **Diagram 5B**.
 - All welds to be 3/16" fillet.
 - Weld both sides of key, starting 1/2" from end truck channel.
 - Weld in direction away from channel, as shown by arrows in **Diagram 5B**.
 - Weld end of key.
- 5.9 Remove end trucks from bridge girder.

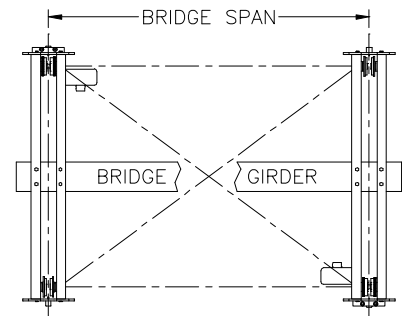
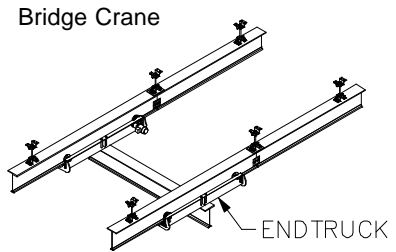


Diagram 5A.

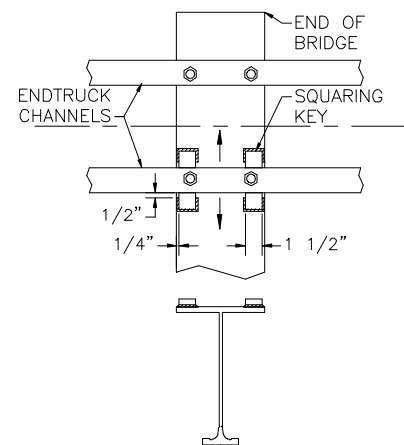


Diagram 5B.

STEP 5 - BRIDGE AND END TRUCK INSTALLATION (CONTINUED)

Note: Wheels on the End Truck may not rotate freely while it is bound to a pallet. Installation procedures in Step 5 should be followed to ensure proper End Truck operation.

- 5.10** Split the end truck by removing the two yokes as shown in **Diagram 5C**. Take note that the two bolts attaching the guide roller angle are 1/4" longer than the remaining bolts. Remove the pinion shaft and bearings as shown in **Diagram 5D**.

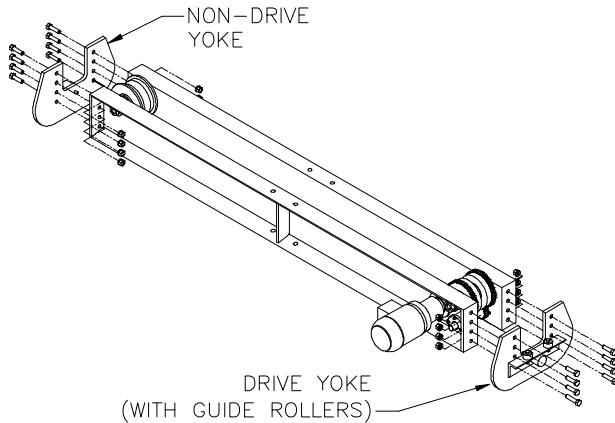


Diagram 5C.

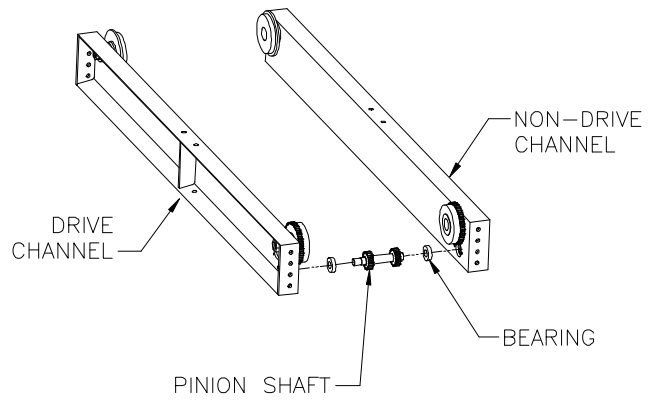


Diagram 5D.

- 5.11** Bolt motor assembly in place as shown in **Diagram 5E**. Terminal box should point towards the center of the end truck. Check for proper mesh between the motor pinion and drive wheel.
- 5.12** Insert bridge to end truck connection bolts (**Diagram 5F**). Depending on the rail profile, they may not be able to be inserted after end truck is placed on runway. Finger-tighten lock washer and hexnut.
- 5.13** Lift end truck halves onto runway, placing the wheels on the rail tread (**Diagram 5G**). Pinion shaft and bearings must be put back into position.

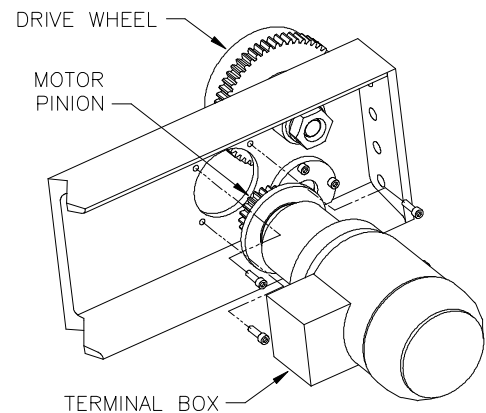


Diagram 5E.

WARNING

End trucks must be fully supported until assembly is complete.

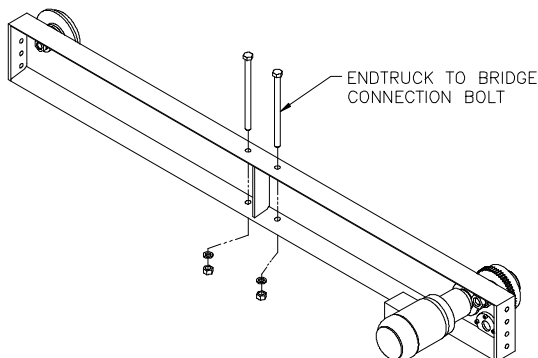


Diagram 5F.

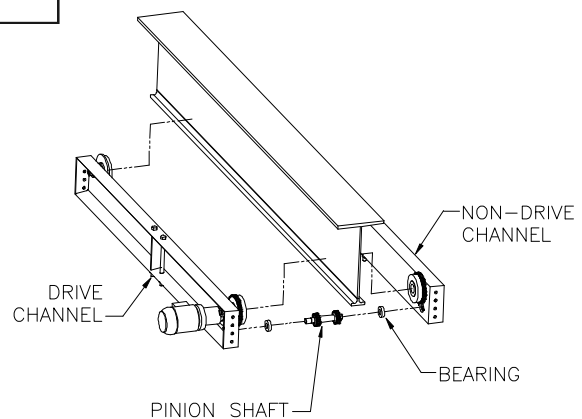


Diagram 5G.

STEP 5 - BRIDGE AND END TRUCK INSTALLATION (CONTINUED)

- 5.14 Replace yokes and hardware (see **Diagram 5H** - rail not shown for clarity). Yoke squaring bars will help to align channels (**Diagram 5J**).

WARNING

The drive yoke (with guide rollers) must be positioned at the drive end of the truck.

- 5.15 Remove hexnut and lock washer from end truck to bridge connection bolts.
- 5.16 Lift bridge into place. The end trucks and bridge are match marked, make sure that the markings on the bridge and end truck correspond. The girder should be snug to the end truck. The squaring keys will fit around the inside channel and aid in aligning the end truck (**Diagram 5K**).
- 5.17 Push the end truck to bridge connection bolts through the bridge top flange and replace the lock washer and hexnut (**Diagram 5K**). Tighten hardware according to Torque Chart, on page 3.

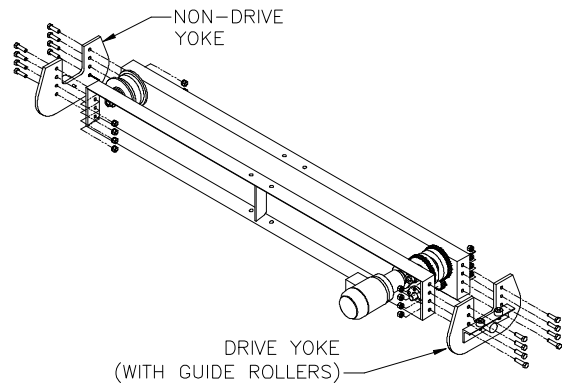


Diagram 5H.

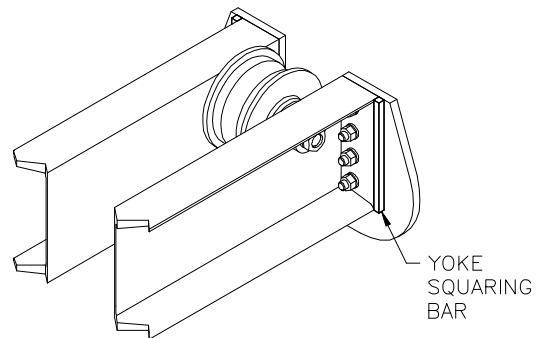


Diagram 5J.

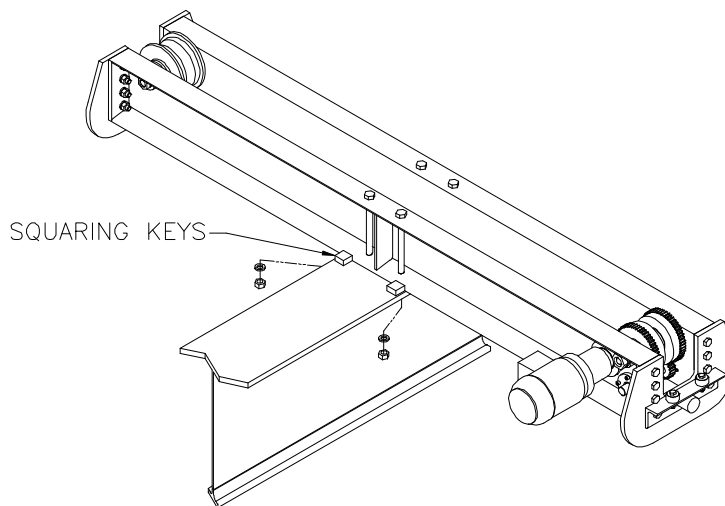


Diagram 5K.

STEP 5 - BRIDGE AND END TRUCK INSTALLATION (CONTINUED)

Note: End truck bracing is required for all bridge spans of 50'-0" or greater. Bracing is also required if the ratio of bridge span to top flange width is equal to or greater than 50:1.

5.18 If required, attach bracing to end truck and bridge girder as shown in *Diagrams 5L, 5M,* and *5N*. Make sure bevel washer is included (*Diagram 5N*).

5.19 Tighten end truck and bridge hardware.

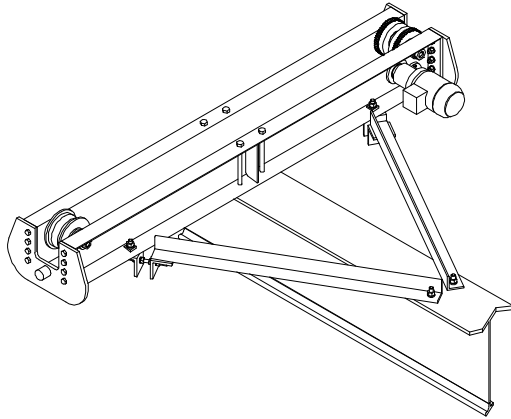


Diagram 5L.

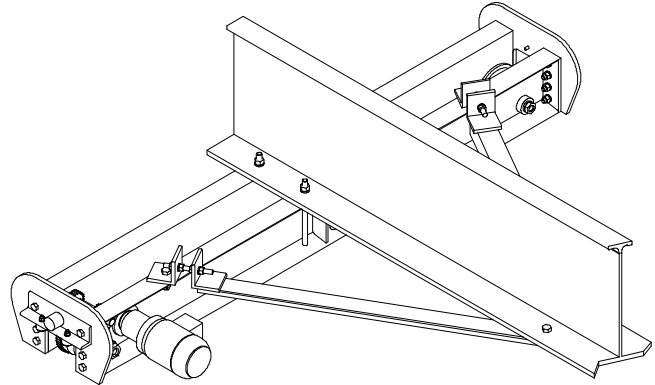


Diagram 5M.
(View of underside of end truck)

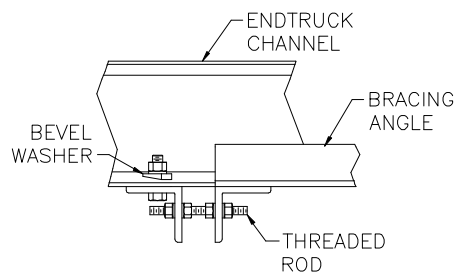


Diagram 5N.

5.20 Tighten threaded rod hardware according to *Diagrams 5P* and *5Q*.

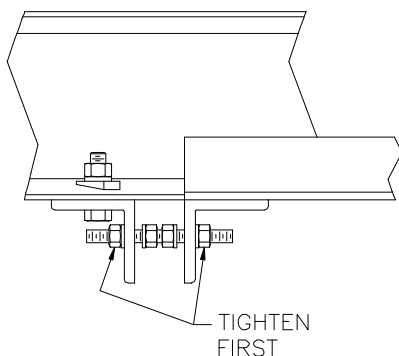


Diagram 5P.

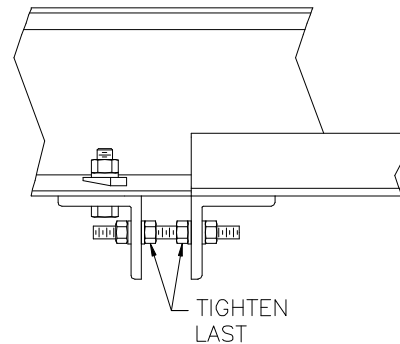


Diagram 5Q.

STEP 6 - CARRIER INSTALLATION

6.1 If ordered, Cleveland Tramrail™ will provide one of the following motor driven carriers:

Motor Drive Carriers - Without Electric Hoists - WT and WS Series

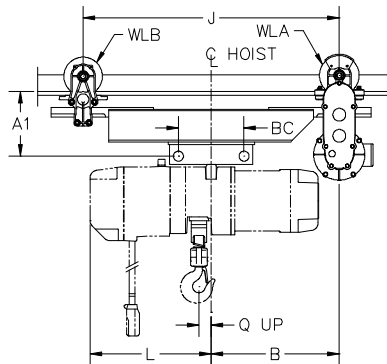


Diagram 6A. WT Carrier (2 Head).

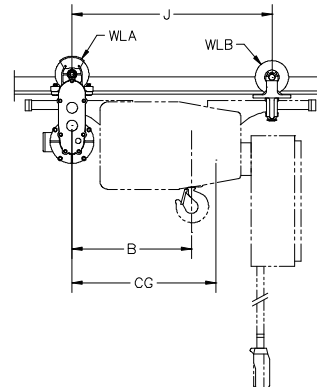


Diagram 6B. WS Carrier (2 Head).

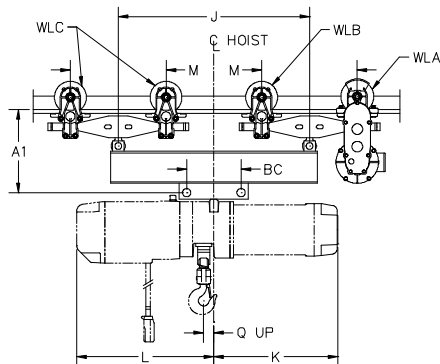


Diagram 6C. WT Carrier (4 Head).

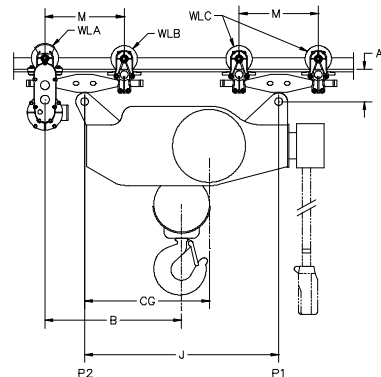


Diagram 6D. WS Carrier (4 Head).

- 6.2 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.
- 6.3 Be sure end stop is installed opposite the end of bridge from the end carrier is loaded into.
- 6.4 If possible install carrier by inserting onto end of bridge girder.
- 6.5 If end clearance prohibits sliding the carrier onto track, drive and idler heads have to be split and reassembled on the bridge girder. Single piece frame type idler heads can be installed on the track by removing the wheels.
- 6.6 If a festoon tow arm is not being utilized on the trolley, go to Step 11, on page 19. If a tow arm is being utilized on the trolley, go to Step 7, on page 15.
- 6.7 Assemble the tow arm weldment on the festooning end of the carrier.
- 6.8 Install end stop on the festooning end of bridge girder (Step 3, on page 6).
- 6.9 Make sure all connections are secure using the proper hardware and torque to specification.
- 6.10 Mount hoist to carrier and make proper electrical connections per hoist manufacturer's recommendations.

STEP 7 - C-TRACK FESTOONING INSTALLATION

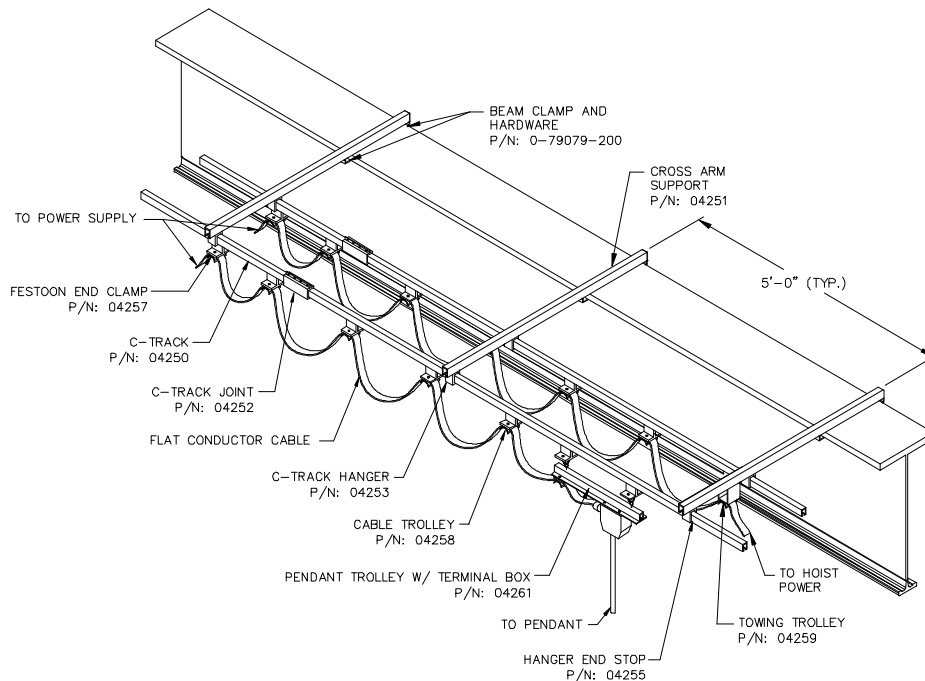


Diagram 7A. C-Track Festooning.

- 7.1 Divide total length of beam by 5'-0". This will give equal number of spaces of cross arm support brackets. The remainder should be divided equally among each end.
- 7.2 Measure in the distance from end of Tarca™ track from Step 7.1 above and install first cross arm support piece. Secure on each side of top flange with beam clamp and hardware (P/N: 0-79079-200). Remaining cross arm supports to be installed at 5'-0" increments along top flange of rail.
- 7.3 Bolt track hangers (P/N: 04253) loosely to cross arm supports, while sliding each 10'-0" long section of C-Track (P/N: 04250) into place. Start at one end of system.
- 7.4 Install track joints (P/N: 04252) as required. They will support the adjacent sections of track. After all track sections and hangers are in place, secure all fasteners.
- 7.5 Install festoon end clamp (P/N: 04257) and hanger end stop (P/N: 04255) to one end of system.
- 7.6 Install cable trolleys (P/N: 04258) into track system. If it is convenient, cables may be installed into trolleys on the floor, establishing correct size of loops and tie wrap cables as needed.
- 7.7 Install the towing trolley (P/N: 04259) or pendant trolley (P/N: 04261). Alternate method would be to install *all* trolleys and cable into a length of C-Track and lift into place.
- 7.8 Install second hanger end stop onto open end of C-Track.
- 7.9 The selected cable connectors can be installed in the appropriate junction boxes and the cable connected.
- 7.10 Repeat the above steps as necessary for second C-Track.

STEP 8 - ENCLOSURE MOUNTING DETAIL

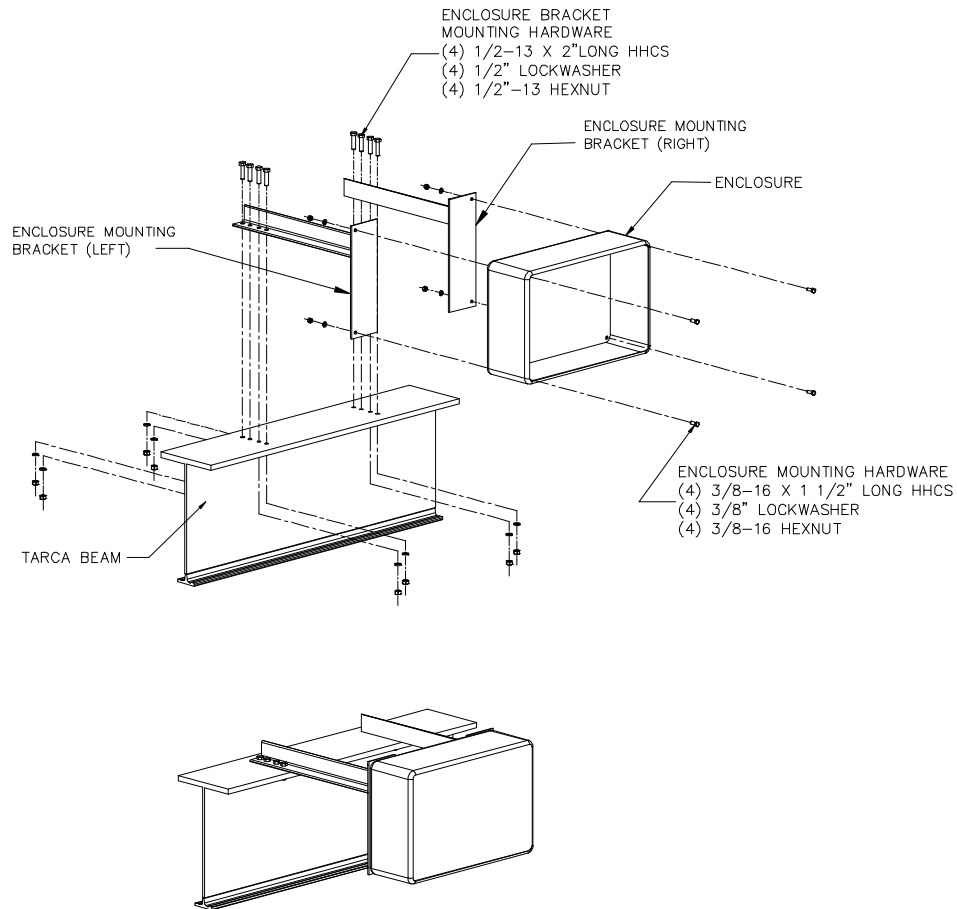


Diagram 8A. *Enclosure Assembly.*

- 8.1** Attach enclosure mounting bracket to top flange of beam by lining up bracket holes with pre-drilled holes on top flange. Make sure orientation of Left / Right brackets is correct.
- 8.2** Attach enclosure box to face of brackets using hardware provided.

STEP 9 - BRIDGE GIRDER CONDUIT INSTALLATION

➔ **TIP:** If requested, Cleveland Tramrail™ can install the rigid conduit on the bridge girder. Installer will be responsible for attaching control enclosure (Step 8) and making all flexible conduit connections. Reference Step 10, page 18, for motor wiring.

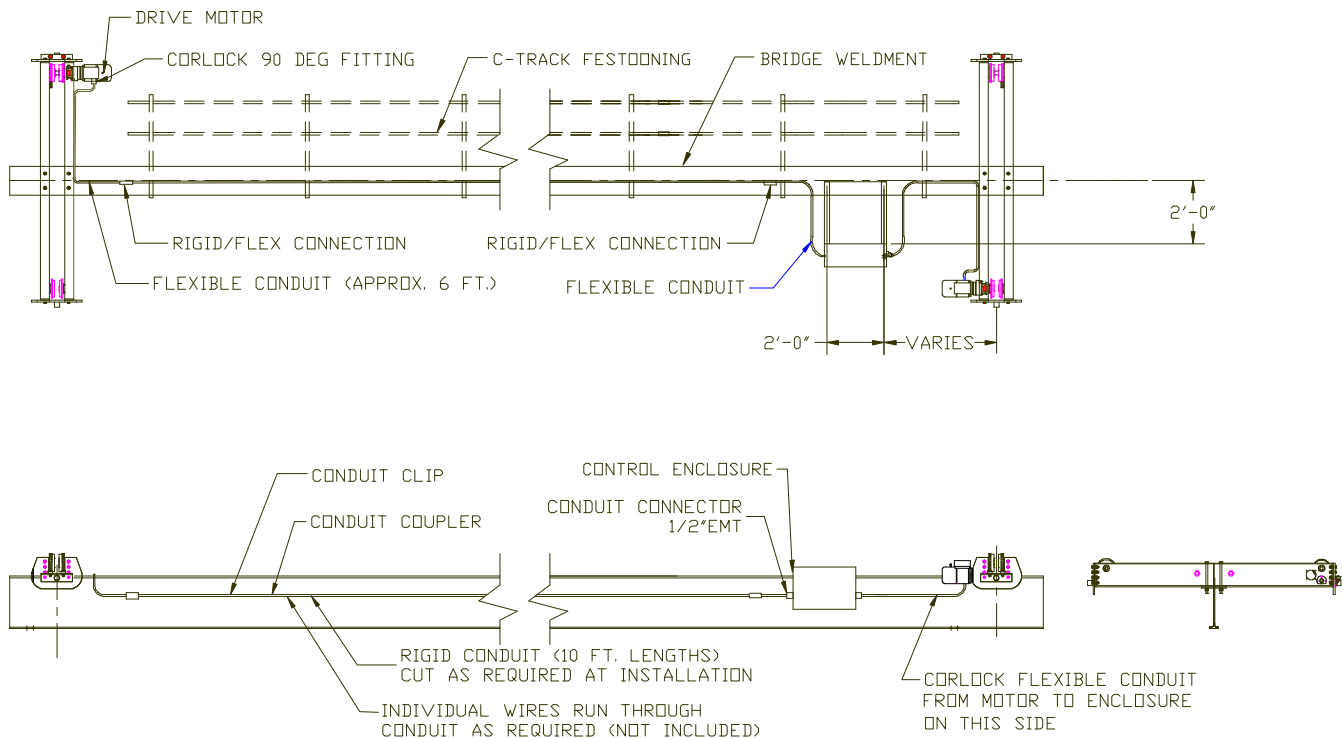


Diagram 9A. Bridge conduit wiring diagram.

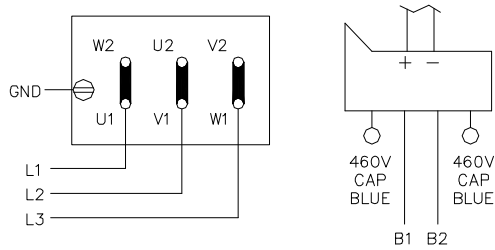
- 9.1 If not already installed by Cleveland Tramrail™, secure rigid conduit approximately 12-14" below top flange of girder. Conduit is shipped in 10 ft. lengths to be cut and threaded as needed.
- 9.2 Individual control wires to be fed through rigid conduit (by others).
- 9.3 Flexible conduit to be mated to rigid conduit with connectors provided.
- 9.4 Flexible conduit to be routed as shown (**Diagram 9A**) into either side of control enclosure.
- 9.5 Far ends of conduit to be routed to drive motors on either end of bridge. On the end opposite enclosure, it will be necessary to route conduit over top flange of bridge assembly.
- 9.6 **Note:** No junction boxes are required if it is not required to splice wires. A rigid / flex connection can be used with a continuous length of wire from enclosure to motor.

STEP 10 - MOTOR WIRING

Note: Brake control must be on separate circuit.

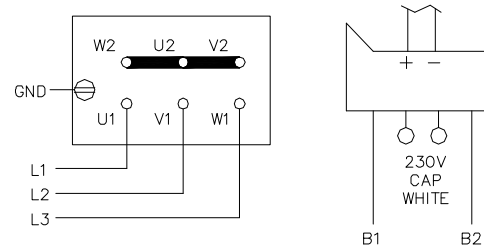
10.1 Wire according to appropriate figure below.

10.2 Motor and brake voltages must be identical.



208/230 VAC WIRING

Diagram 10A.

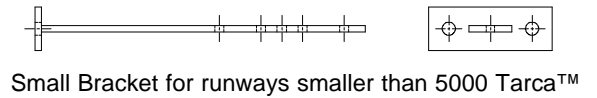


460/575 VAC WIRING

Diagram 10B.

STEP 11 - CONDUCTOR BAR INSTALLATION

11.1 Your conductor bar hanger will vary according to **Diagram 11A**.



11.2 Bolt hanger brackets to web of runway with 1/2" hardware. If using large bracket, **Diagram 11A** with the holes at the top of the bracket.

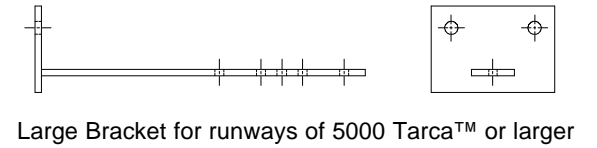


Diagram 11A.

11.3 Both brackets have hole patterns as shown in **Diagram 11B**. Bolt conductor bar hangers to brackets according to **Diagram 11C** or **11D**, depending on your situation.

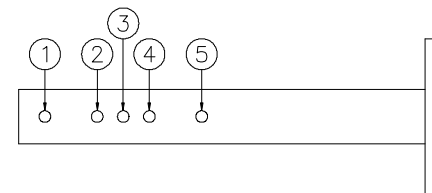
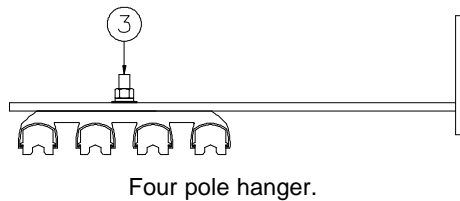
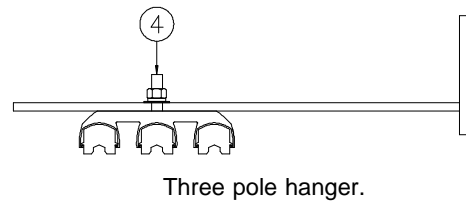


Diagram 11B.

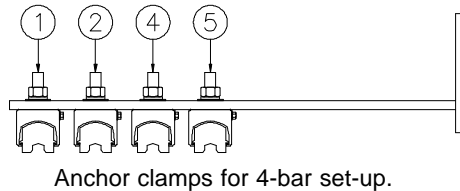
11.4 Each system requires the use of anchor clamps. The anchor clamps will replace one regular conductor bar hanger and serve to prevent the bars from sliding back and forth on the runways. These anchor clamps should be placed in the center of the conductor bar system (**Diagram 11E**).



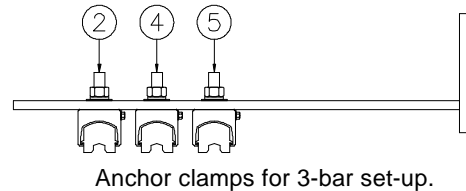
Four pole hanger.



Three pole hanger.



Anchor clamps for 4-bar set-up.



Anchor clamps for 3-bar set-up.

Diagram 11C.

Diagram 11D.

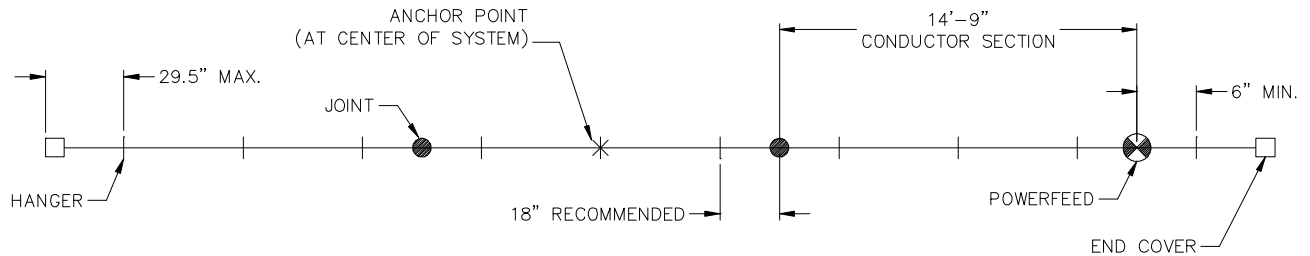


Diagram 11E. Typical conductor bar.

STEP 11 - CONDUCTOR BAR INSTALLATION (CONTINUED)

11.5 Attach collector bracket to web of end truck channel according to **Diagram 11F**. Bracket may be tack welded or bolted into place. If bolting, locate the bracket as shown, mark the hole locations, and drill three $\text{Ø}3/8$ " holes.

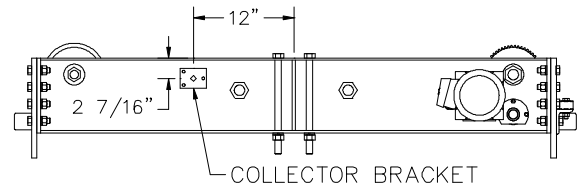


Diagram 11F.

11.6 Slide the first collector onto the collector bracket as shown in **Diagram 11G**.

11.7 Position collector so it lines up with the first conductor bar (**Diagram 11H**) and tighten collector bolts to clamp it into place.

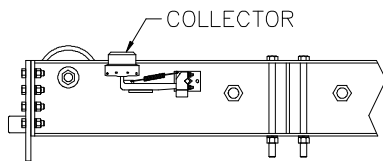


Diagram 11G.

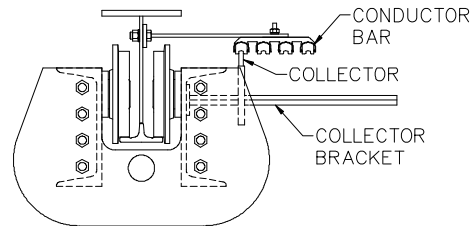


Diagram 11H.

11.8 Strip the end of the collector wire and insert into the collector as shown in **Diagram 11J**.

11.9 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.

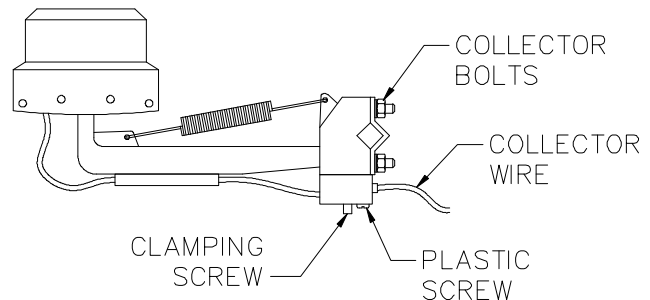


Diagram 11J.

11.10 Repeat Steps 11.6 through 11.9 for the remaining collectors.

11.11 Run the collector wires back to the J-Box (**Diagram 11K**). Within the J-Box, splice the collector wires to the conduit wires. Run the conduit back to the electrical enclosure and secure to the bridge with conduit clips. Depending on the situation, the conduit and J-Box can be mounted on top of the bridge flange or on the bridge web.

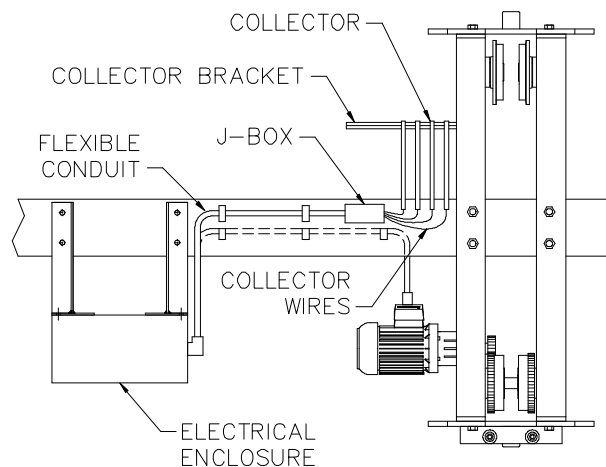


Diagram 11K.

STEP 12 - FINAL STEPS

➡ **TIP:** Do not throw away this manual: Refer to maintenance schedule that starts on page 26.

- 12.1 Check to make sure all bolts are tightened to specifications and lock washers are flat.
- 12.2 Be sure to sway brace the crane as required. Refer to Sway and Thrust Bracing Guidelines on Page 22.
- 12.3 If necessary, touch up crane with paint provided.
- 12.4 Check to assure that power supply is in conformance with crane specifications as ordered.
- 12.5 If load test is required, it should be performed per latest ANSI B30.11 specification.
- 12.6 Keep Packing List, Installation Manual, General Arrangement Drawing, and any other inserts filed together in a safe place.

SWAY AND THRUST BRACING GUIDELINES

WARNING

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

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. On two runway systems only one of the runways is to be laterally braced. Install the lateral braces at each suspension point. If the support center/top flange width ratio exceeds 40:1, additional lateral bracing is required. The other runway must be left free to float and provide a relief for variations in runway alignment, crane deflections and building variations.

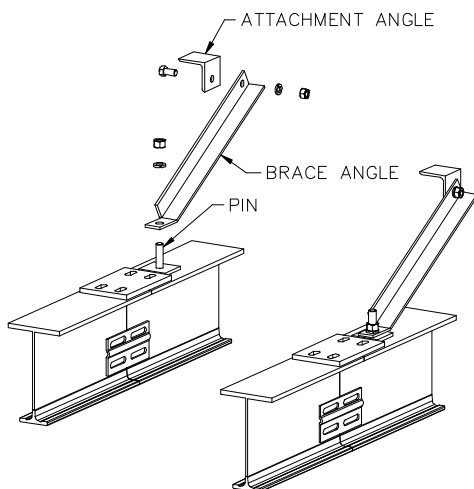
On three runway systems, only the center runway should be braced.

In a direct interlocking crane system, the runways of each crane closest to the interlock must be tied together. The gage of the runways must be held to a tolerance of plus or minus 3/16 inch (5 mm) from the nominal dimension.

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.

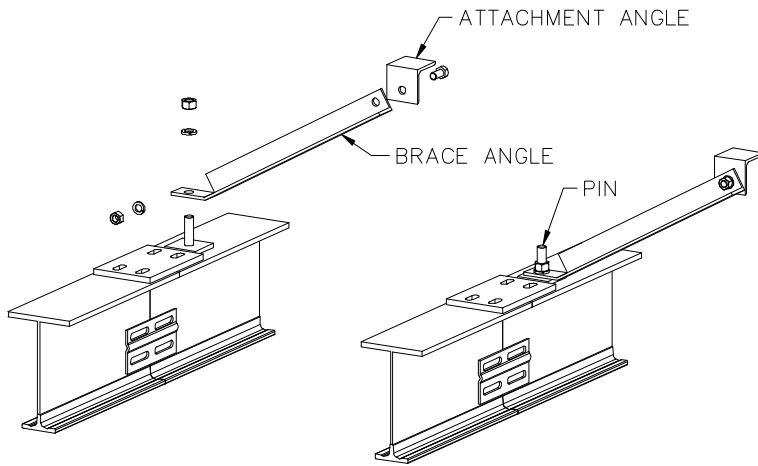
The lateral force on crane runways to provide for the effect of moving crane trolleys shall, if not otherwise specified, be 20 percent of the sum of the weights of the lifted load and of the crane trolley (but exclusive of other parts of the crane). The force shall be assumed to be applied at the bottom 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.

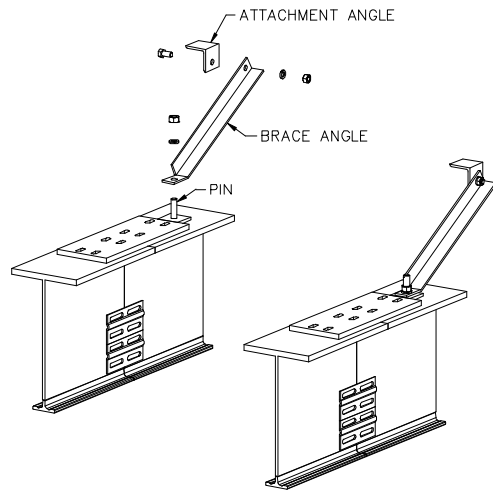


Longitudinal Bracing
(4200 - 4600 Tarca™ beam)

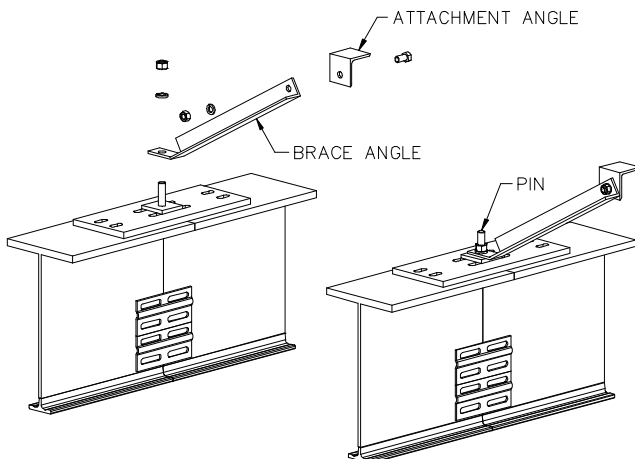
SWAY AND THRUST BRACING GUIDELINES (CONTINUED)



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. Cleveland Tramrail™ 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 Cleveland Tramrail™. This warranty shall not cover wearable parts, including but not limited to wheels, gears, pinions, bearings, motors, electrical controls, and crane electrification. 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 CLEVELAND TRAMRAIL™ WITH RESPECT TO ITS PRODUCTS AND ALL SUCH WARRANTIES ARE HEREBY SPECIFICALLY DISCLAIMED. CLEVELAND TRAMRAIL™ 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. Cleveland Tramrail™'s obligation and Purchaser's or end user's sole remedy under this warranty is limited to the replacement or repair of Cleveland Tramrail™'s products at the factory, or at the discretion of Cleveland Tramrail™, at a location designated by Cleveland Tramrail™. Purchaser or end user shall be solely responsible for all freight and transportation costs incurred in connection with any warranty work provided by Cleveland Tramrail™ hereunder. Cleveland Tramrail™ 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 Cleveland Tramrail™ are not included in this warranty. Purchaser's or end user's remedy for components and accessories not manufactured by Cleveland Tramrail™ 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

Cleveland Tramrail™ 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

Cleveland Tramrail™ 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

Cleveland Tramrail™'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

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

E) DEALER OR DISTRIBUTOR NOT AN AGENT

Cleveland Tramrail™ and Purchaser agree that Purchaser has been put on notice that dealer or distributor is not Cleveland Tramrail™'s agent in any respect for any reason. Cleveland Tramrail™ 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 Cleveland Tramrail™'s behalf other than those specifically set forth in Cleveland Tramrail™'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 Cleveland Tramrail™ 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 Cleveland Tramrail™ and shall not pass to the Purchaser until the full amount herein 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. Cleveland Tramrail™ 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 Cleveland Tramrail™ 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 Cleveland Tramrail™. 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 Cleveland Tramrail™ up to the time of cancellation plus 15%.

Returns:

No equipment, materials or parts may be returned to Cleveland Tramrail™ 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 Cleveland Tramrail™ for expense, if any, incident to such delay.

Changes and Alterations:

Cleveland Tramrail™ reserves the right to make changes in the details of construction of the equipment, as in its judgement, 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 Cleveland Tramrail™ is not obligated to make such changes in products previously sold any customer.

Third Party Action:

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

OSHA Responsibilities:

Cleveland Tramrail™ 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 Cleveland Tramrail™, 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:

Cleveland Tramrail™ 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. Cleveland Tramrail™ agrees to maintain non-segregated work facilities and comply to rules and regulations of the Secretary of Labor or as otherwise provided by law or Executive Order.

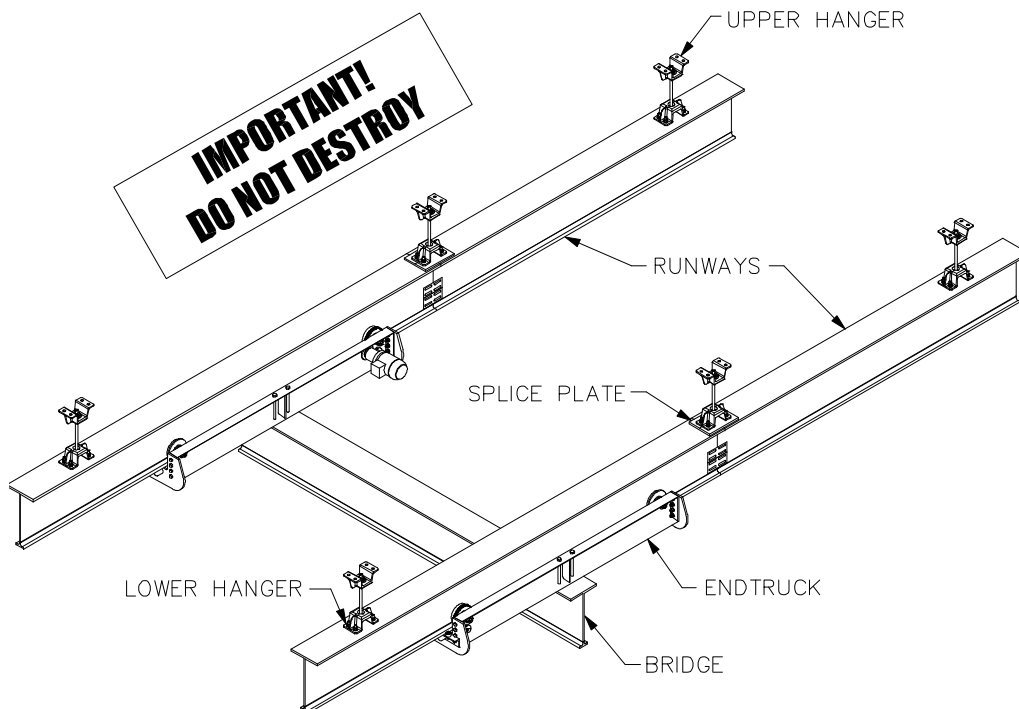
INSPECTION AND MAINTENANCE SCHEDULE

PATENTED TRACK CRANE AND MONORAIL: INSPECTION AND MAINTENANCE SCHEDULE			
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 6 months
2	Lower Hanger Bracket	Check that lock washers are compressed and nuts tightened to manufacturer's specifications.	Every 6 months
3	Motor	See manufacturer's recommendations.	N/A
4	Splice Joint	Check track for alignment and that wheel rolling surface is flush.	Every 6 months
5	Carrier Trolley	Check mounting pin. Check hardware. Check idler heads and wheel assemblies.	Every 4 months
6	End Stops (runway/bridge/monorail)	Check for full compression of lock washer. If through-bolt is exposed, replace end stops.	Annually
7	Festooning	Check all wiring connections. Check that hardware is tightened to specification.	Every 6 months
8	Wheels	Check for cracks, excessive wear, pits, and/or grooves: all of these increase pull forces. If any of these conditions exist, wheels should be replaced.	Every 6 months
9	Hoist / Gearboxes	Check oil level in all gear boxes and replenish if necessary. Grease all bearings when grease fittings are supplied.	Every 6 months

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

WARNING

Any changes in rolling effort or unusual noises must be immediately identified and corrected. It is not necessary to lubricate the track or sealed bearings. Lubricating may attract airborne particles and may increase the rolling resistance. (Do not use such substances as WD40, silicone sprays, oil or grease on sealed bearings or on track tread surfaces.)



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Fishers, NY 14453-0593
Phone: (800) 821-0086
Fax: (800) 828-1808

E-Mail: info@clevelandtramrail.com
<http://www.clevelandtramrail.com>
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PERIODIC INSPECTION AND LUBRICATION RECOMMENDATIONS

The following is a checklist to be followed in performing periodic inspections and preventative maintenance on Cleveland Tramrail™ Equipment. 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 Cleveland Tramrail™ Customer Service Department.

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

PERIODIC INSPECTION AND MAINTENANCE CODE:

D - Daily	3 - Three Month Intervals
W - Weekly	4 - Four Month Intervals
M - Monthly	6 - Semi-Annually
	12 - Annually

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

TRACKS & RUNWAYS

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Fittings	12	Check for loose bolts & cracked fittings			
Hanger Rods	12	Chair Washer Suspension: check for plumb, equal tension* if paired rods, levelness of system, and loose set screws. Check roll pins top & bottom. Check for cracks. Make sure that rod swing is not impeded due to interferences.			

TRACKS & RUNWAYS (CONTINUED)

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Track	12	Check for rail wear (replace if raised tread is gone). Check welds for incipient cracks. Check underside of rail for wear from drive rollers. When groove is 1/8" deep, replace track. Check side of rail for wear. When width has decreased more than 1/8", replace track.			
Joints	12	Check for loose or worn rivets or if welded type, for incipient cracks.			
End Stops	12	Check for loose bolts or if welded type, for incipient cracks.			
Paint	12	Clean periodically and repaint where corrosion is present. *Strike with hammer and compare sounds.			
Wheels	3	Lubricate regreaseable wheels. Check for loose wheel bearings. Check wheel diameter for wear (replace when 1/4" under original diameter).	*Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal).		
Geared Drive	4	Check oil level. Change oil as ambient temperature requires. Check gear wear through backlash. Check for worn bearings (excessive noise). Check for loose bolts in gear case cover.	*		
Head	6	Check for thrust washer wear.	*Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal).		
Frames		Check for incipient cracks and loose bolts. Lubricate.			
End Trucks	12	Check for loose bolts and incipient cracks in welds or casting.			
Conductor Bar and Collectors	6	Check for tightness of mounting brackets. Check for tightness of collector shoe on stem. Check for tightness of wire leads. Check for excessive wear of shoe.			

TRACKS & RUNWAYS (CONTINUED)

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Motors	6	Feel motor after active use for excess heat (130° C or 266° F max. with class "B" insulation). Check brush holders, springs, motor bearings and oil seals. Tighten loose bolts. Blow out dust. Lubricate.			
Controls	6	Check for burned contacts, broken shading coils, worn or cracked arc barriers, auxiliary contacts, and proper seating. Check mechanical latch devices for wear.			
Electric Brakes (Disc)	4	Adjust air gap for wear. Check lining thickness. Check for broken shading coils. Check rotating disc at spline for excessive wear. If wet type brakes, clean out sludge and change oil. Check armature hinge pins for wear and armature guides for binding.			
Collectors	3	Check for tightness of mounting brackets. Check for tightness of collector shoe on stem. Check for tightness of wire leads. Check for excessive wear of shoe. Replace when top surface of shoe is 1/16" above top of stem.			
Paint	12	Clean periodically and repaint where corrosion is present.			
Interlock and Discharge Point	6	Check for wear and broken parts. If forks do not raise fully, adjust or replace parts. Re-adjust torque limiter if excessive slip is in evidence. Check and adjust for proper limit switch operation.	Spray Molycote		

BRIDGE

TROLLEY & MONORAIL CARRIERS

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Structural Frame & Load Bars	12	Check for incipient cracks in welds and castings. Check for loose bolts.			
Eye Bolts, Suspension Pins, & Ball Joint Rocker Assembly	M	Check for loose or missing set screws or lock pins. *Grease spherical bearing housing monthly through grease fitting or repack with clean greasing at three (3) month intervals. Check for cracks and excessive wear.	Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal).		
Wheels & Guide Rollers	3	Check for loose 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.	Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal).		
Geared Drive	4	Check oil level. Change oil as ambient temperature requires. Check gear wear through backlash. Check for worn bearings (excessive noise). Check for loose bolts in gear case cover. *NOTE: When lubricating through grease fitting or repacking, suspension pins & ball joint rocker assembly should be raised approximately 1/4".	See Lube List		
Motors	6	Check motor bearings and oil seals. Tighten bolts. Blow out dust. Also see motor Manufacturer's recommendations.			
Control	6	Check for burned contacts. Check mechanical latch devices for wear and freedom of movement. Check for loose connections.			
Electric Brakes (Disc)	4	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.			
Collectors	3	Check for tightness of mounting brackets. Collector tubes must be vertical. Check for tightness of collector shoe on stem. Check for tightness of wire leads. Check for excessive wear of shoe.			

HOIST

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Cable	3	Check for broken wires & kinked cable. Check cable anchors. Lubricate.	Rope Lubricant		
Bottom Block	3	Check for hook wear or enlarged hook opening. Check hook collar for tightness. Check for jagged edges, loose bolts, cracked shrouds, worn or broken sheave flanges, worn sheave grooves and bearings. Lubricate.			
Drum	3	Check for worn grooves and worn bearings. Lubricate.			
Gearing	3	Check oil level. Check for gear wear, noisy worm bearings, loose mounting bolts, and cracks in housing. Change oil as ambient temperature requires. Lubricate.	See Hoist Maintenance Manual		
Load Brake	3	Check oil level & adjustment.			
Motor	3	See manufacturer's recommendations.			
Brake (Motor)	3	See manufacturer's recommendations.			
Limit Switch	3	Check contacts. Tighten leads. Check for loose bolts and binding. Lubricate if required.			
Push Buttons & Pendant	3	Check contacts. Tighten leads. Check for sticking buttons. Check ground wire continuity. Check pendant cable top and bottom for broken wires. Check strain chain to see that any pulling force is not put on pendant cable.			
Paint	12	Clean periodically and repaint where corrosion is present.			

CURRENT CONDUCTOR BAR COLLECTORS

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Bar	12	Check for corrosion, bowing, or sagging. Check alignment at moving gaps. Realign if necessary.			
Couplings	12	Check bolt or screw tightness. Check for corroded contact surfaces.			
Supports	12	Check for loose bolts and/or screws and bent brackets.			
Insulators	12	Check for loose bolts, sheared support ears, current carrying deposits on surface.			
Bar Covering	12	Check for accidental abrasion and peeled covering.			
Current Tabs	12	Check bolt & terminal screw tightness. Check for corroded contact surface.			
Grounds	12	Check for ground continuity. Check at load side of disconnect switch (current off), with megger, for overall system insulation resistance.			
Collectors	4	Check for worn wheels, wheel pins, or slider shoes. Check flexible leads from wheel clevis pigtail or slider shoe shaft. Check tightness of lead connections. Check for cracked insulators. If wheel type, lubricate. On type "ST" collectors, check for free movement or pantograph. Lubricate pivot pins as required. Collector bracket tubes should be vertical within 1/16". Bend or replace if necessary.	*Bentone grease type NLGI Grade 1 (Lubriplate Brand 930-AA or equal).		

TRACK SWITCHES

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
Outer Frame	12	Check for loose support bolts. Check levelness of frame in both directions.			
	12	Check for excessive wear at latch holes or on latch cams.			
Inner Frame	12	Check rollers (should not rock with level outer frame).			

TRACK SWITCHES (CONTINUED)

Item	Insp. Code	Inspection Procedure	Lube Type	Date Last Insp.	Remarks
	12	Check latch pin or rollers for full and positive engagement. Make sure operator fasteners are tight.			
Slides	12	Clean. Check for wear and lubricate.	Molycote		
Jumper Harness	12	Check for loose or corroded connections or abrasion.			
Grounds	12	Check for continuity.			
Track	12	Check for worn ends. Check for raised tread. Check for track width. Check for cracked welds. Replace track or switch if badly worn. Check alignment at rail gaps. Should be within +/- 1/16 vertically and horizontally. If realignment is necessary, adjust throw first then shim and align adjacent rails.			
Electrical	12	Check control panel and/or junction box terminals. Check contacts. Tighten loose screws.			

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" & "LT" tractors	Straight mineral oil - SAE-50
Type "GW" gantry head	Straight mineral oil - SAE-50
Type "CT" tractor unit	Multi-purpose gear oil - SAE-80
Type "HT" tractor unit	Multi-purpose gear oil - SAE-80
Type "G" gantry head	Multi-purpose gear oil - SAE-80
Type "GH" gantry head	Multi-purpose gear oil - SAE-80
Special gantry drive heads	Multi-purpose gear oil - SAE-80
Type "E", "R" & "RA" motor heads	Multi-purpose gear oil - SAE-80
Worm gear drives	A.G.M.A. #8 compound
Compact drives ("CDA", "CDB" and "L")	A.G.M.A. #8 compound
Current collector wheels	Barium graphited cup grease NLGI #2

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.