

Patented Track Rail 325 Series

Review all general instructions prior to starting installation. Note that there is no single, most appropriate method or procedure for all installations, and these instructions cannot cover all variables at each work site, the differences in equipment available for handling the rail, or the experience of the installation crew.

DANGER

Lifting Operations

Installation of products such as TC/American Monorail's rail requires performance of overhead lifting operations. Proper lifting procedures involve training, skills and experience beyond the scope of this document. Workplace supervisors are responsible to assure that all persons under their supervision are properly trained, properly equipped, and are following safety practices appropriate for the lifting operation being employed.

DANGER

Overhead Mechanical Assembly

Persons performing installation and assembly of overhead equipment must use caution while lifting, assembling and adjusting components. These operations are frequently conducted from manlifts or platforms that require specific knowledge, training and operation skills beyond the scope of this document.

Access to the floor below the work area must be restricted to reduce the potential of personnel injury due to falling objects.

Workplace supervisors are responsible to assure that all persons under their supervision are properly trained, properly equipped, and are following appropriate safety practices.

DANGER

Electrical Equipment Installation, Service and Maintenance

Persons performing installation, service or maintenance activities on, near, or with equipment that is electrically powered are exposed to electrical hazards that could result in serious injury or death if proper precautions are not followed. Before performing such work, disconnect the electrical power source for the system at the disconnect device and lock it out, following appropriate Lockout/Tagout (LOTO) procedures, to prevent electric power from being applied while work is being performed.

All persons must use safe work practices appropriate to the electrical system, and follow all workplace procedures and policies. This requires specific knowledge, equipment and training beyond the scope of this document. Workplace supervisors are responsible to assure that all persons under their supervision are properly trained, properly equipped, and are following appropriate safety practices.

Index

Item	Page
A. General Safety Alerts.....	1
B. Patented Track Rail – Model Numbers and Descriptions	3
C. General Installation Instructions	
D. Responsibilities	4
E. Overhead Rail Handling and Installation	4
F. Before Beginning Installation	4
G. General Runway and Monorail Installation Practices.....	5
H. Rail Suspension Systems	6
I. Installing 325 Series Rail in a Crane or Monorail System	7
J. Initial Start-Up	8
K. Maintenance of Rail Systems.....	8
L. 325 Series Rail Wear and Replacement Criteria	9
M. Terminology Notes	9
N. 325 Series Rail	
O. 352 “L” and 325 “H” Series	10
P. 325 Series Rail Specifications	11
Q. Rail Options	
R. Alignment Splice Assembly.....	12, 13
S. End Stops	14, 15
T. Top Flange Holes.....	16
U. Rail Notch or Step Cut.....	16
V. Rail Web Holes	17
W. Rail Expansion Joints	17
X. Spur Support Brackets	18
Y. Other Options.....	18
Z. Rail Manufacturing Standards.....	18
AA. Runway and Monorail Alignment Tolerances.....	19
BB. Inspection Schedule	20

Patented Track Rail

TC/American Monorail offers several models and sizes of our rail. Selection of the appropriate model depends upon the layout of the crane or monorail, the load to be carried, distance between support centers, deflection criteria, and other factors. See the Rail Section of the TC/American Monorail Systems Catalog for information about the rail, and the Engineering Section for methods and procedures to select the appropriate rail.

Rail Model Numbers:

(general information for all current rail)

- The first number(s) of the Model Number identifies the tee section used on this rail series:
 - 2 = 200 Series Rail
 - 3 = 325 Series Rail
 - 4 = 400 Series Rail
 - 45 = 450 Series Rail
- The second character(s):
 - R = Rail (200 Series, 2R3-5T; 400 Series and 450 Series)
 - GR = Girder Rail (200 Series)
 - RL = 325 "L" Series Rail
 - RH = 325 "H" Series Rail
- The next intermediate numbers identify rail by its nominal overall depth, i.e.:
 - 3 = 3" (200 Series, 23R3-5T)
 - 8 = 8" rail
 - 14 = 14" rail
 - 22 = 22" rail
 - Etc.
- The last number (after the "-") is the nominal weight of the rail per foot:
 - 5 = 5 pounds per foot
 - 18 = 18 pounds per foot
 - 26 = 26 pounds per foot
 - 41 = 41 pounds per foot
 - 74 = 74 pounds per foot
 - 129 = 129 pounds per foot
 - Etc.
- A last character (not always present) has the following meaning:
 - T = Tee Section only (200 Series, 2R3-5T)
 - F = 200 Series Rail or Girder Rail Filler

NOTE: See the appropriate section(s) of these instructions for assembly, installation and maintenance details specific to your Rail model.

NOTE: For a specific parts breakdown of the Rail provided with an order, see the drawings provided with that shipment and the Rail Section of TC/American Monorail Systems Catalog.

General Installation Instructions

Reference ANSI MH27.1, Specifications for Patented Track Underhung Cranes and Monorail Systems, and additional referenced Specifications and Standards.

Responsibilities:

- TC/American Monorail, in association with our dealers, will design, manufacture and sell the highest quality equipment possible to meet the product handling needs of the customer. However, TC/A has no direct control over transportation, receipt, handling, installation and operation of our crane and monorail products.
- The selling dealer and the installation crew must properly receive, handle, install and test the equipment before turning it over to the owner, user and operating personnel.
- The selling dealer must train the owner, user and operating personnel in operation, conformance to safe operating practices, inspections and maintenance.
- The owner, user and operating personnel must perform, or cause to be performed, required training, proper operation, inspections, maintenance and repairs. Records of actions are to be maintained.

Overhead Rail Handling and Installation

- Runways, monorails and all associated components must be erected in a manner that assures the safety of all personnel involved.
- Runways, monorails and all associated components must be erected in a manner that maintains the condition of the equipment as it was manufactured and delivered to the site.
- Runways, monorails and all associated components must be erected by an experienced and qualified installer, with proper equipment for lifting and rigging as appropriate for the application.
- Practices and recommendations contained within these instructions are minimums and are not intended to exclude other considerations. Not all items are applicable to all installations.

Before beginning the installation:

- When shipment is received, remove all shipping materials and visually inspect all parts for damage. Repair and/or replace if necessary.
- Check packing lists against materials received and identify all parts.
- Gather all TC/American Monorail drawings, plus any vendor equipment drawings, and keep in a secure location for reference during installation and start-up, and to give to end user for future reference.
- Store all equipment in a clean, secure area prior to final assembly and installation.

General Runway and Monorail Installation Practices:

- No holes shall be made in the building structure without permission from the owner.
- All supporting structures to which the track is suspended shall be installed in accordance with the specifications of the American Institute of Steel Construction, current edition.
- Where supporting steel or equipment is erected by welding operations, such work shall be installed in accordance with the standards of the American Welding Society, or equivalent technical publication.
- It is the responsibility of the installer and customer to verify that the building structure is capable of supporting the loads imposed by a crane or monorail system, and to modify the structure as required if necessary. Consider the building structure deflection caused by the calculated maximum hanger loads and verify that total deflection (building plus monorail, runway and crane) is within acceptable limits. For buildings with limited structural capacity, it may be necessary to supply a “self-supported” system (support structure independent of the building).
- To avoid creating stress points for possible failure, hanger rods should never be welded or have welding connections applied to them. If any field threading is necessary, care must be taken to prevent undercutting or sharp roots of threads.
- Check all hanger fittings provided and compare to hanger locations and elevations shown on print (see Crane and Suspension drawings). Be sure these fittings will give the dimensions required for the proper elevation before track is hung.
- Bracing of rail systems, if required, is the responsibility of the installer and is determined largely by field conditions to accomplish the following:
 - ✓ Monorail tracks must be side braced to prevent swinging, if rod suspended. Normally, this is done at each splice joint.
 - ✓ Monorail tracks with motor driven carriers must also be end braced to prevent racking caused by stopping and starting of carriers.
 - ✓ Switches should be rigidly connected directly to superstructure.
 - ✓ If switches are supported by hanger rods, the switches must be rigidly braced.
 - ✓ Curves must be rigidly braced.
 - ✓ Crane runway systems normally require one runway to be side braced when runways are hung from rods. Both runways must be end braced.
 - ✓ It is best to brace system after leveling and installing conductor bars. If bracing is done before conductor bar is installed, be sure 1" clearance is maintained from any portion of conductor path.
- Rail joints at splices should be ground smooth and level. The maximum gap between adjacent rail ends should not exceed 1/16", except at switches or other free ends when 3/16" is permitted (1/8" preferred).
- Setting the final proper elevation of all tracks is the responsibility of the installer. Elevation of rail treadline throughout any system is to be held $\pm 1/8"$, with elevation readings taken at each track hanger, switch, etc. See *Runway and Monorail Alignment Tolerances* section in this document.

Rail Suspension Systems:

- Be familiar with all hanger types used for suspension for the crane or monorail system – see the TC/American Monorail Systems Catalog, drawings provided with the order, or the Operation and Maintenance Manual provided with the job.
- Each hanger is designed to handle the listed maximum capacity and is utilized in the system to the designated maximum hanger load.
- Be certain that each hanger is used at its designated point. Some systems use more than one type of hanger.
- There are two types of suspension methods: rigid and flexible.
 - Rigid suspension systems include direct bolt, direct bolt to brackets, direct bolt to stools, beam flange clamps, rigid rods with a combination of hangers and clamps, or a combination of all of the above.
 - Flexible suspension systems are a hanger rod system using rods, clamps and hangers with special spherical washer and seat fittings that allow the installer some latitude in locating hangers and clamps relative to the runway rail and the support steel. As compared to “rigid suspension” components, these flexible suspension components may be directly bolted or clamped to overhead support steel or the runway top flange without shimming for “out-of-level” conditions, within some limitations. Flexible Suspension components are not intended to provide a “free-swinging” system.
 - See the TC/American Monorail Systems Catalog, Engineering Section, for more a more complete definition and description of suspension systems.
- High-strength rods are used on all flexible hanger rod suspension systems. Do not, under any circumstances, weld or apply heat to any load carrying rod.
- All load carrying fasteners are minimum Grade 5 or A325. Any fasteners of a lesser grade will change the hanger or clamp capacity.
- A flat washer must be used if the diameter of the hole is greater than 1/16" above the fastener diameter or has a slotted hole.
- Each fastener must have a lock washer under its nut.
- Shimming at hanger points may be necessary to assure the rail is installed level. Unless ordered from TC/American Monorail, shims are the responsibility of the installer.
- After final leveling, check any flexible hanger rod suspension points to assure spherical washers are seated properly. Tighten the set screw on each lock nut, then insert the spring pins.
 - Be certain that all hanger rods are plumb.
 - Recheck fasteners to be certain all are secured, and washers are properly placed.

Installing 325 Series Rail in a Crane or Monorail System:

- Check mark numbers on each track length (see system layout drawings), identify with location on print.
- Check all suspension fittings provided and compare to hanger locations and elevations shown on layout drawings. Before the track is hung, verify these fittings will provide the dimensions required for the proper elevation.
- Lay out system location from print, establishing each hanger location on supporting steel. This can be done by a chalk layout on floor and plumbing up; a line stretched under steel above; or using a transit marking each location. Be sure layout measurements are from proper building reference.
- When installing a monorail system with a switch or curves, start installation at a switch and curve located in the system and install rails sequentially from the switch or curves to the ends of the monorail. For a single run of rail without switches or curves, start at one end and work sequentially toward the other end.
- Refer to *Runway and Monorail Alignment Tolerances* in these instructions for tolerances for monorail straightness and elevation.
- When installing crane systems, start the rail installation with the line of runway that has the electrification. If a spur track or crossover is part of the system, start at that point. Then level, align and brace this rail. Align the rail both parallel and perpendicular to the web. Always level the rail from the riding tread, never from the top flange. The riding tread elevation should be held within $\pm 1/8"$. Refer to *Runway and Monorail Alignment Tolerances* in these instructions. This rail becomes the benchmark and reference point to install the balance of the crane runway system.
- For multiple crane runways, the procedure is the same except that all crane runway spans are measured to the first crane runway installed as a benchmark. Span tolerances should not exceed $\pm 1/8"$. Refer to *Crane Runway Alignment Tolerances*.
- Before rail sections are raised into position, electrification, track hangers, etc. should be assembled onto track. Bolts should be snug, capable of slight movement for final adjustment.
- Make splices between rail sections as each track is hung. Splice bolts can be started but left loose. A hanger must be centered over each rail splice. If top of adjoining rails are not flush at splices when treads are aligned, shims must be used under the low side of lower hanger fittings to bring it up to level.
- Final adjustments of entire track system:
 - ✓ Start at most advantageous location and adjust one section to elevation and alignment. Proceed from this section to bring each connecting rail into corresponding line and elevation.
 - ✓ Monorail tread alignment at splice points is most important, both horizontally and vertically. Splices will hold this alignment if properly installed. Where track hangers span the track joint at top flange, it is the responsibility of the installers to place shims under one side of hanger if there is a difference in track girder depths. Shims provided by installer.
 - ✓ After entire system has been leveled, tighten all connection bolts. Make sure each is secured with lock washer.
 - ✓ When all hangers are properly installed, the track splices can be tightened for final tread alignment. Tighten splice bolts securely (flatten the lock washers). Stake threaded ends at three places, approximately 120° apart, to prevent loosening.
 - ✓ The monorail tread line may require a minimum amount of grinding (feathering) at the splice points, to provide a smooth transition from one piece to another.

Initial Start-Up:

- After installation of the crane or monorail system is completed, operate the crane or hoist throughout the full extent of the runway or monorail.
- Observe how the hoist trolley tracks the monorail. Trolley must remain centered on the riding tread and not scrub hard against the tee section edge during transition through a curve or switch.
- Observe how the crane trolleys track the runway. The runway gauge must match the crane span at all hanger points, and the trolleys must remain centered on the riding tread. Trolleys with flanged wheels may "float" slightly from side to side, but must not scrub hard against the tee section edge as the crane travels the length of the runway. Trolleys with side rollers should follow the runway tee section without excessive pressure against the side rollers at any point. Runway rails manufactured and installed to tolerances will maintain proper gauge between hanger points within the designed operation of the crane.
- Verify that trolley wheels transition over tee splice joints smoothly. See note for splice assembly installation about grinding tread.
- Verify that crane or hoist trolleys pass by all splice assemblies without rubbing or catching on overly long bolts.
- Verify that trolleys do not catch on interlock components.
- Verify that suspension hardware or components do not interfere with crane and hoist components.
- Verify that electrical conductor bars are properly installed, that electrical collectors properly track their respective conductors, and that collectors travel smoothly throughout the entire run.
- Verify that trolleys, loadbars or bumpers properly engage to end stops.
- Make any corrections necessary before continued operation.
- Refer to job specific Operation Manual for any additional start-up requirements.
- Conduct load test as required.
- Turn over system to owner or user. Conduct operator training as required.

Maintenance of Rail Systems:

- Every rail system must be checked periodically to assure that all installation tolerances are maintained as described in the preceding items. Adjust as required.
- Each system should be carefully inspected about 30 days after original installation. Vibration may loosen components that could not be secured because of paint, burrs, high spots, etc. All systems should be checked a minimum of once per year for loosening or wear. Tighten, adjust or repair as required.
- New buildings or new construction may settle or shift and cause monorail or crane runway systems to become out of tolerance. Adjust back to within tolerances as required.
- TC/American equipment is designed to give maximum service. However, like any other piece of machinery, it must be given regular and careful inspection and maintenance.
- The suspension fittings and component parts have been designed to withstand the stress of normal operations. No equipment will last forever. Make certain all nuts are kept tight and that hangers are periodically inspected. In the event any of these show wear, nicks or distortion, determine the cause of the wear, correct the cause and replace the worn components immediately.
- This system has been designed for certain load limits. Operating personnel should be advised that these load limits are not to be exceeded. In the event that any unusual shock is introduced into the system, investigate to determine if any damage has been done. Repair as required.
- A system that has excessive rail movement may be introducing stresses which have not been anticipated, thus creating a potentially dangerous situation. The system should be examined and care should be taken to see that this situation is immediately corrected.

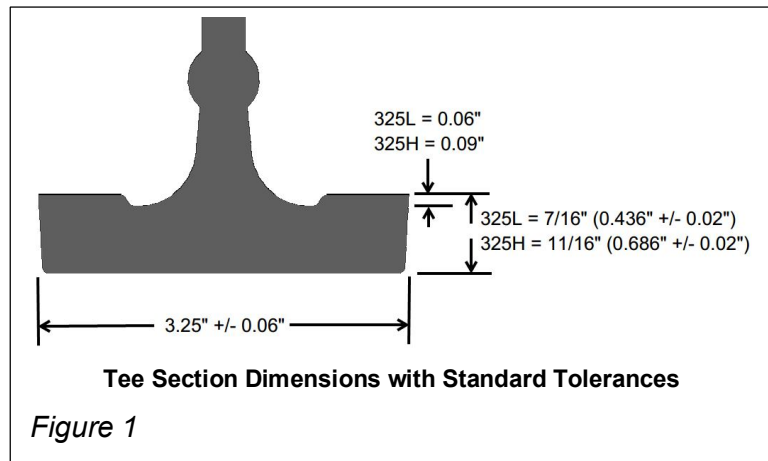
325 Series Rail Wear and Replacement Criteria

TC/American Monorail patented track rail will provide many, many years of service before replacement must be considered. Use the following information to determine when replacement is eventually recommended:

- For 325L and 325H Series rail, the rail will have full rated capacity until the raised portion of the riding tread is worn down.
- Flange width must be maintained to assure proper wheel width contact. Recommended maximum rail width wear is 1/8" for 325 Series rail.
- Wheel loads approaching the maximum allowable for the rail section (2750 pounds per wheel for 325L Series rail, 5000 pounds per wheel for 325H Series rail) justify replacement of worn track at the above noted allowances.

Figure 1: tee section profile with standard dimensions and tolerances.

Note: Because the tee sections are mill rolled shapes, they are subject to manufacturing tolerances. To accurately monitor rail wear, sample measurements must be taken at installation and again at periods of time during the life of the system to record actual wear. Measure and record the values at several representative locations throughout the system, taking all subsequent measurements at the same locations. All measurements must be taken by similar measuring devices and in a consistent manner. Also, make note of any changes to loads.



Note: If the tee section surfaces are worn flat and parallel, the trolley wheels are likely to be in good condition. However, if the tread surfaces are worn to a tapered condition, then the wheels are also likely worn tapered. Such wheels would very quickly ruin new replacement track. Under this condition, trolley wheels should also be replaced. If the tapered wear extends below any portion of the raised portion of the riding tread, the rail should be considered for replacement.

Terminology Notes

The following instructions use these unique terms:

- “Treadline” – the flat riding surface of the rail tee section on which the trolley wheels roll. All elevation measurements for patented track systems are made to the treadline.
- “Span” – when used to define a crane, refers to the horizontal distance from one runway rail to another, or also to the distance between end trucks on a crane. May also refer to the distance from one support on a piece of rail to a support at the other end of that rail.
- “Gauge” – the center-to-center distance between the two crane girders of a double girder crane. May also be used to refer to the center-to-center distance between the two rows of rail of a runway system.
- “Support Centers” – the distance from one support on a piece of rail to a support at intermediate points or a support at the far end of that rail.

325 Series Rail

325 "L" Series and 325 "H" Series

TC/American Monorail 325L and 325H Series Patented Track Rails are all 3-piece composite beams with an ASTM A36 top flange and web, and a load carrying tee section rolled from high carbon-manganese alloy steel.

All 325 Series tee sections are 3 1/4" wide with a raised riding tread. The 325L tee section is 7/16" thick, measured at the riding tread, and the 325H tee section is 1 1/16" thick.

Figure 1: (Page 9) tee section dimensions and tolerances.

Figure 2: typical general configuration of TC/American Monorail Patented Track Rail. Rails are manufactured in various standard lengths. Rails may be ordered in nominal lengths and cut to fit in the field, or are factory cut to the exact lengths required for each order.

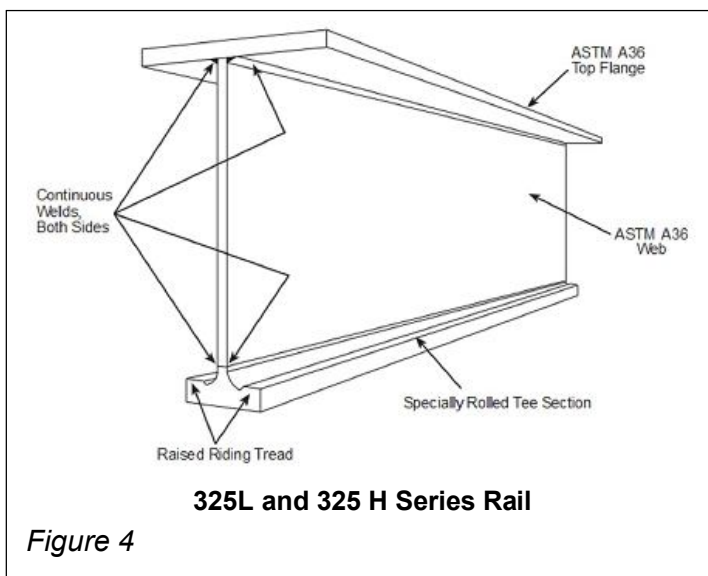
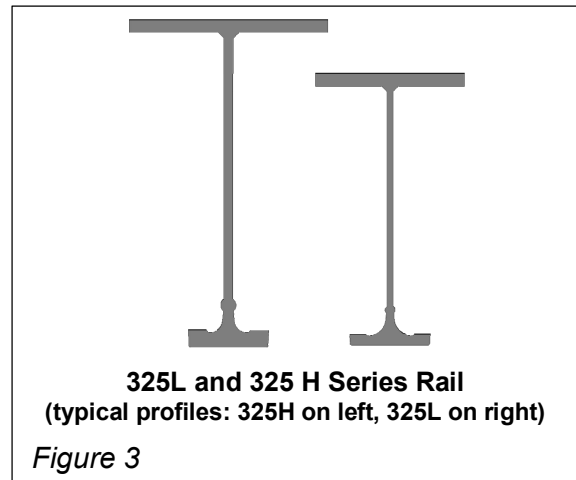
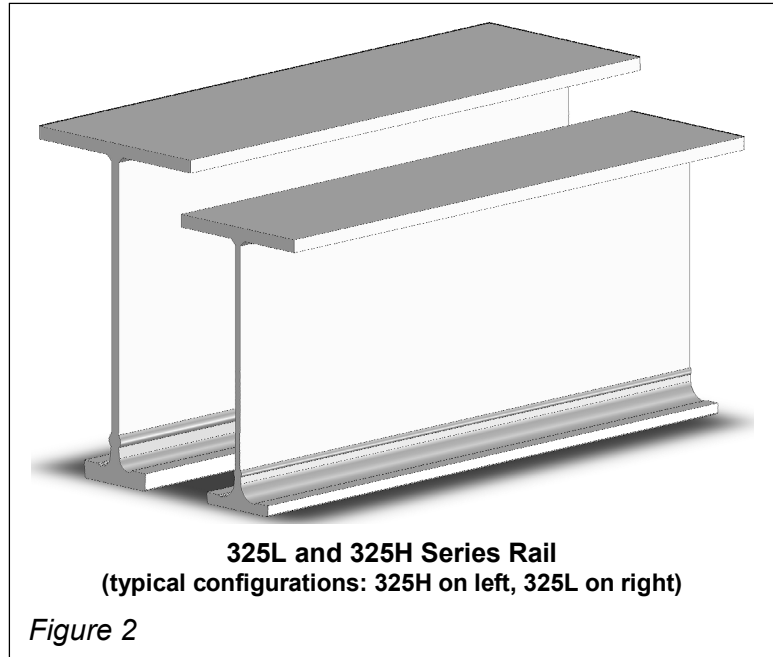
Rail may be ordered with "plain" or "square" cut ends as shown in Figure 2, with splice plate assembly holes as shown in Figure 11, or provided with any of the end stop assemblies shown on Page 14, and various other preparations for interlocks, switches, notched ends, etc.

Figure 3: end profile of typical 325L and 325H rails.

Figure 4: 3-piece composite beam construction.

Figures 5 and 6: (Page 11) standard rail dimensions.

See the TC/American Monorail Systems Catalog for additional specifications and load carrying capabilities.



325 Series Rail Specifications

Model	Weight (#/ft)	Dim. A	Dim. a	Dim. B	Dim. C	Dim D
3RL8-16*	16.3	7 13/16"	7 3/8"	4"	3/8"	1/4"
3RL8-18	17.6	7 13/16"	7 3/8"	5"	3/8"	1/4"
3RL11-19*	19.0	10 13/16"	10 3/8 "	4"	3/8"	1/4"
3RL11-21	21.4	10 13/16"	10 3/8 "	6"	3/8"	1/4"
3RL11-24	24.0	10 15/16"	10 1/2"	6"	1/2"	1/4"
3RL13-22*	22.3	12 15/16"	12 1/2"	4"	1/2"	1/4"
3RL13-27	27.4	12 15/16"	12 1/2"	7"	1/2"	1/4"
3RL14-35	35.0	13 15/16"	13 1/2"	8"	1/2"	3/8"
3RH13-30*	29.6	13 3/16"	12 1/2"	4"	1/2"	3/8"
3RH13-36	36.4	13 3/16"	12 1/2"	8"	1/2"	3/8"
3RH14-33*	32.6	14 5/16"	13 5/8"	4"	5/8"	3/8"
3RH14-41	41.1	14 5/16"	13 5/8"	8"	5/8"	3/8"
3RH16-47	46.8	16"	15 5/16"	12"	1/2"	3/8"
3RH18-52	52.2	18"	17 5/16"	11"	5/8"	3/8"
3RH20-67	66.5	20"	19 5/16"	13"	5/8"	1/2"
3RH22-74	74.1	22"	21 5/16"	15"	5/8"	1/2"
3RH24-84	83.7	24"	23 5/16"	15"	3/4"	1/2"
3RH26-90	89.6	26"	25 5/16"	16"	3/4"	1/2"
3RH28-93	93.0	28"	27 5/16"	16"	3/4"	1/2"
3RH30-110	110.0	30"	29 5/16"	16"	1"	1/2"
3RH32-120	119.8	32"	31 5/16"	18"	1"	1/2"
3RH34-130	130.0	34"	33 5/16"	20"	1"	1/2"
3RH36-140	140.2	36"	35 5/16"	22"	1"	1/2"
3RH38-144	143.6	38"	37 5/16"	22"	1"	1/2"
3RH40-154	153.8	40"	39 5/16"	24"	1"	1/2"

* Curve Rail only

Figure 5

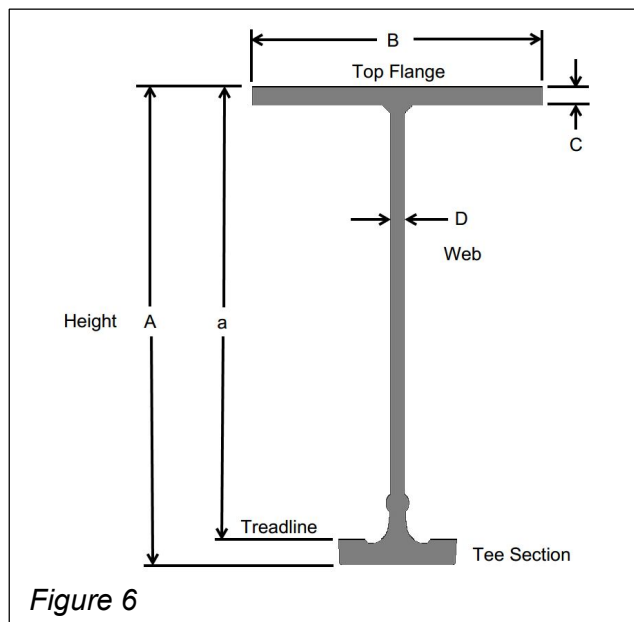


Figure 7: typical 325 Series rail piece, cut to length per order, with “plain” or “square” ends, less end stops, less splice plate holes, less top flanges holes, less web holes for mounting conductor bar.

Painted with standard TC/American Monorail gray-green enamel if used for monorail or runway, or yellow if used on a crane. Other types of paint, colors and surface preparations are optional.

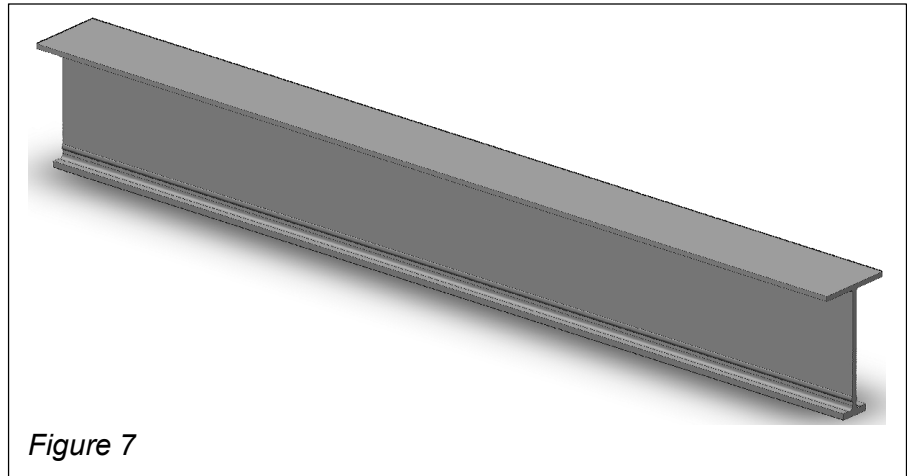


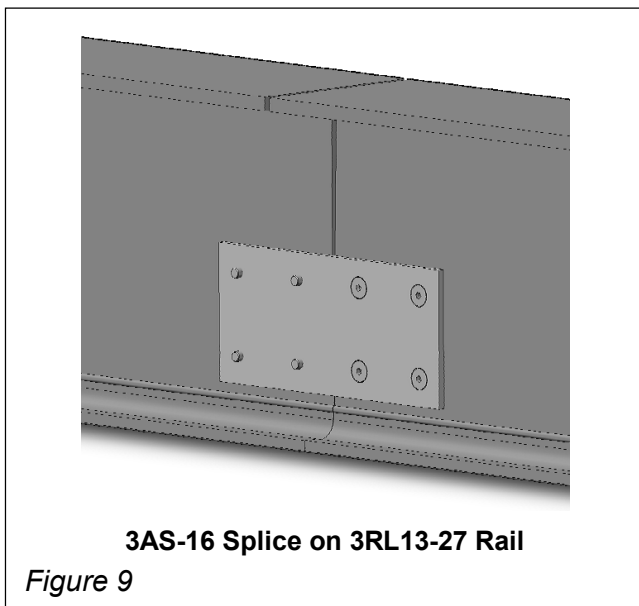
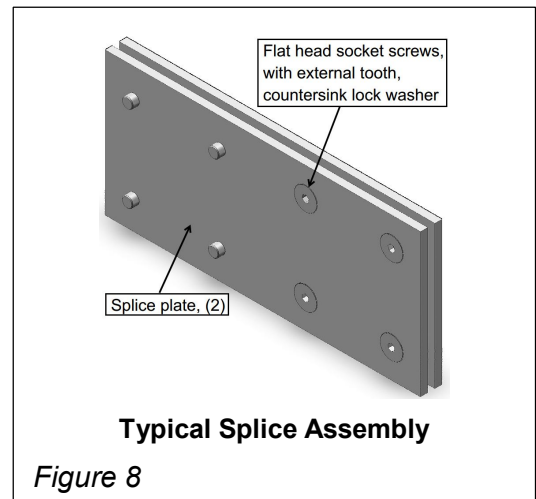
Figure 7

Rail Options

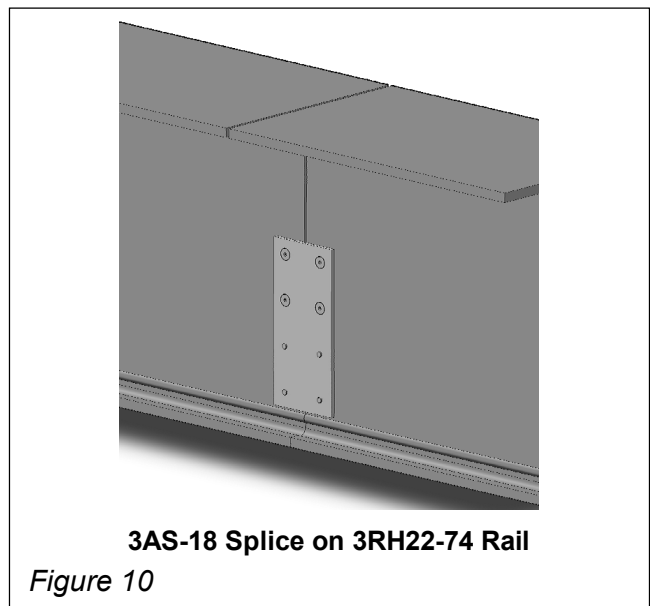
Alignment Splice Assembly: tee section ends of adjoining rails are held in alignment by a splice plate assembly. Splice assemblies may be ordered with mounting holes factory punched in the rail ends, or holes may be field drilled (see Systems Catalog for locations).

Rails 3RL8-16 thru 3RH16-47 use 3AS-16 splices
 Rails 3RH18-52 thru 3RH40-154 use 3AS-18 splices

Figures 8, 9 and 10: splices consist of two identical 1/4” thick web plates with 8 holes, 4 holes are threaded and 4 are countersunk. 3AS-16 splices have 3/8-24 x 1” flat head socket screws, the 3AS-18 splices have 3/8-24 x 1 1/8” screws. Lock washers are external tooth, countersink type. Plates are the same for both assemblies.



3AS-16 Splice on 3RL13-27 Rail
 Figure 9



3AS-18 Splice on 3RH22-74 Rail
 Figure 10

Figures 11 and 12: ends of rails ordered with “Splice Prep” are cut with an approximate 1/8” taper.

Figures 13 and 14: taper assures that ends of tee sections of adjoining rails can be positioned tightly together, as shown.

Splice assemblies are non-load carrying.

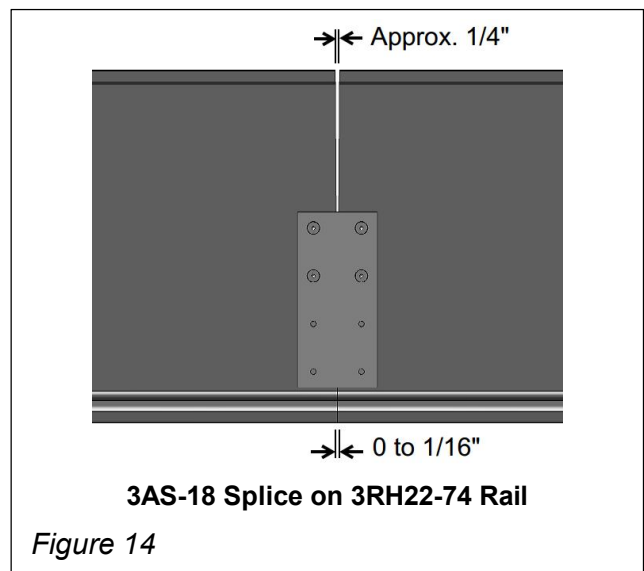
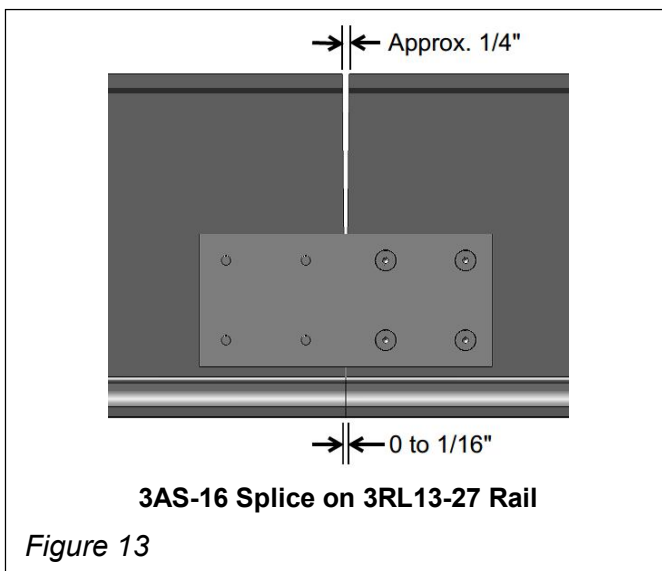
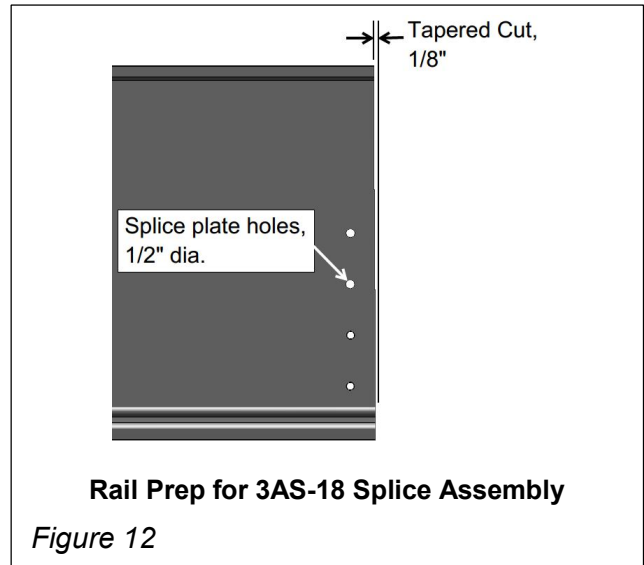
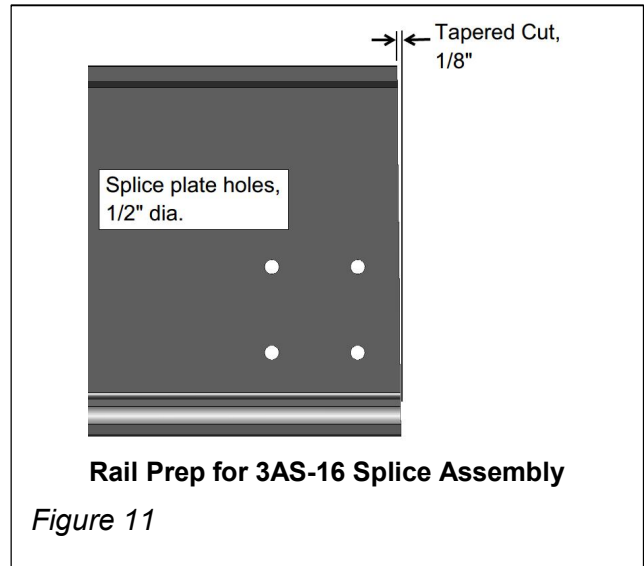
Note: leave splice assembly bolts loose until all suspension hardware (and/or hanger rods) are installed and any shims are installed.

Adjoining rail sections may vary slightly in depth, even if they are the same rail model. Shims must be used as required between the top flange and hanger, or between the top flange and support steel, to align the tee sections at the riding tread and sides of the tees. See *Suspension Installation Instructions*.

Tighten splice bolts securely (flatten the lock washers) after rail is installed and aligned. Note that splice bolts are 3/8” diameter, but are installed in 1/2” rail holes. This clearance provides for rail gap tolerance. Stake threaded ends at three places, approximately 120° apart, to prevent loosening.

Note: after rail is aligned and leveled, and all hardware is tight, check tread-to-tread alignment at splices. Grind (“feather”) any minor treadline misalignment or irregularities until flush and level to allow smooth trolley travel.

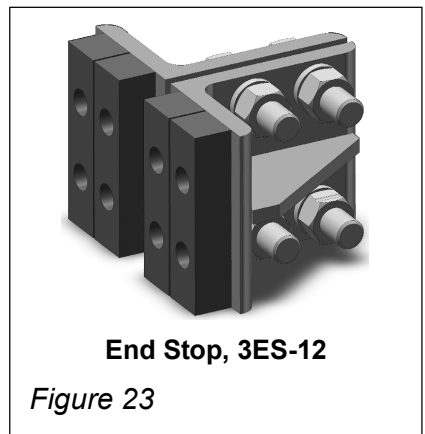
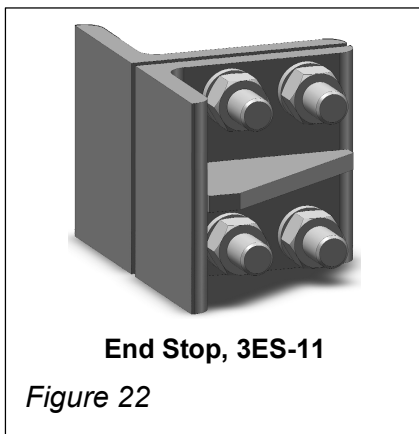
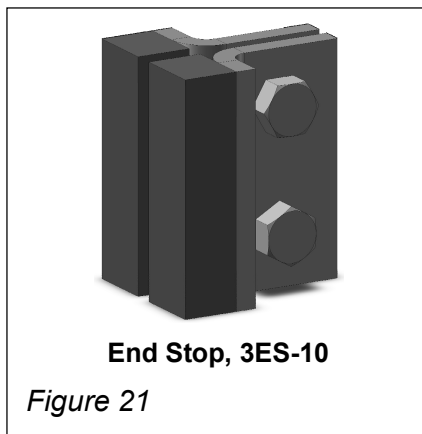
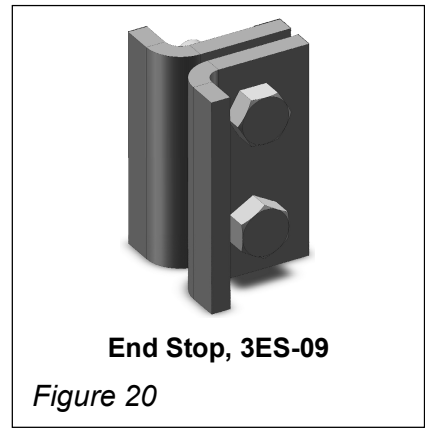
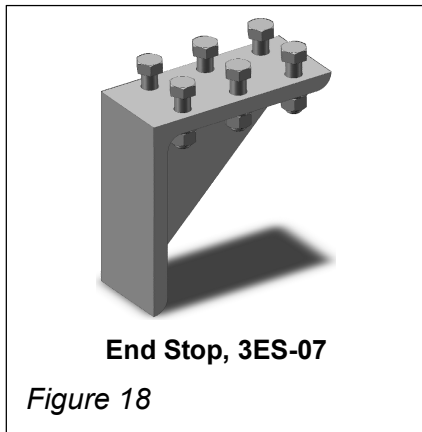
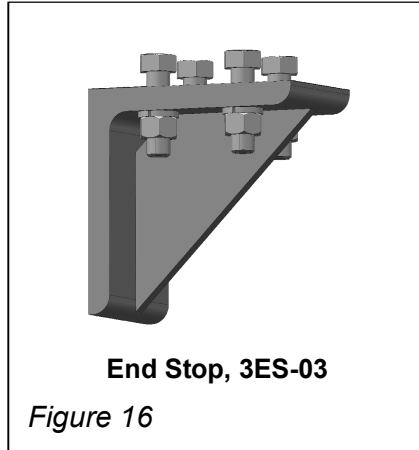
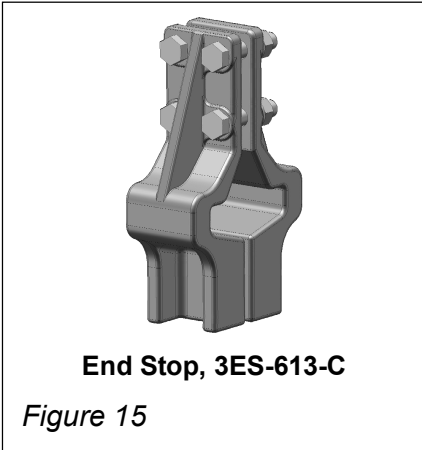
Verify clearance of trolley wheels to end of splice bolts. With some combinations of web thicknesses and trolleys, it may be necessary to cut or grind off the end of the bolts for clearances.

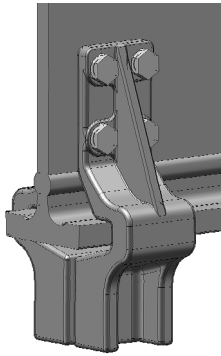


End Stops

Fig.	Model #	Part #	Notes
15	3ES-613-C	10-613-C	Bolts through web; load bar stop; for up to 6½" dia. wheels
16	3ES-03	9229F1261F1	Bolts through tee; load bar stop; for 4", 5" & 6½" dia. wheels
17	3ES-06	9229F1262F1	Bolts through tee; load bar stop; with rubber bumper; for 4", 5" & 6½" dia. wheels
18	3ES-07	9229F1976F1	Bolts through tee; load bar stop; for 325H rail; for 9" dia. wheels
19	3ES-08	9229F1977F1	Bolts through tee; load bar stop; with rubber bumper; for 325H rail; 9" dia. wheels
20	3ES-09	9229F1265F1	Bolts through web; wheel stop; for up to 5" dia. wheels; hand pushed systems
21	3ES-010	9229F1266F1	Bolts through web; wheel stop; with rubber bumper; up to 5" dia. wheels; hand pushed systems
22	3ES-11	10-2997-00	Bolts through web; for hoist manufacturer's trolleys; through 10 ton capacity
23	3ES-12	10-3459-00	Bolts through web; for hoist manufacturer's trolleys; with rubber bumper through 10 ton capacity

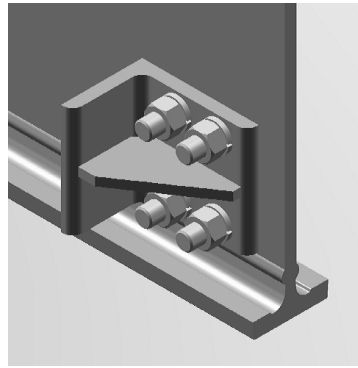
See the Rail Section of the TC/American Monorail Systems Catalog for rail hole pattern dimensions and other information about standard end stops. Contact factory for special applications.





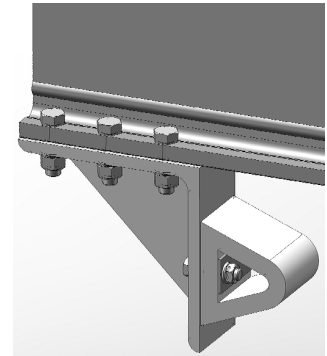
End Stop, 3ES-613-C

Figure 24



End Stop, 3ES-11

Figure 25



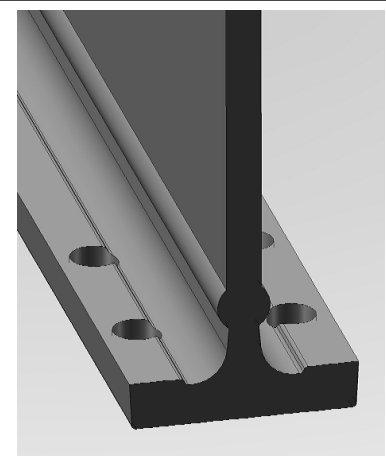
End Stop, 3ES-08

Figure 26

Figures 24, 25 and 26: typical examples of end stops mounted on rail. Note that end stops shown are mounted at the very end of a length of rail. However, in some cases an end stop may need to be mounted inboard of the end, usually to control hoist or crane approach to an obstruction, or as a means to control hook coverage.

Figure 27: view of an end prep for a stop bolted through the tee section.

Avoid using this type end stop if there is a future possibility of repositioning the end stop and then allowing a trolley to ride over these holes in the riding tread. The trolley wheels and tee section will wear quickly, and the wheel load capacity is reduced.



**End Prep: 3ES-03 & 3ES-06
End Stop**

Figure 27

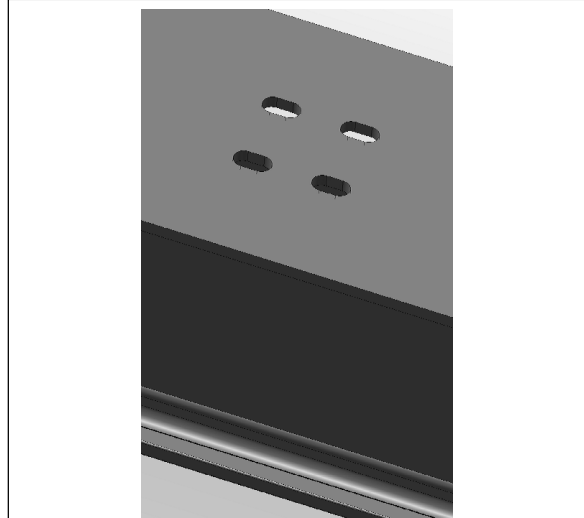
Top Flange Holes

Figures 28 and 29: top flange holes or slots may be factory punched or drilled, or may be field drilled as needed. Top flange hole or slot size and location must be coordinated with the hole pattern of suspension hangers or support steel. Slots allow for rail position adjustment.

See the Rail Section and Suspension Section of the TC/American Monorail Systems Catalog for more information about hole and slot sizes available or required.



Top Flange Slots at Rail End, with Splice Prep
Figure 28



Top Flange Slots at Intermediate Location
Figure 29

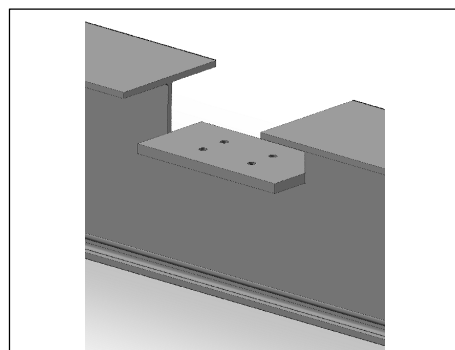
Rail Notch or Step Cut

Rails may be “notched” or “step cut” at hanger points to match one rail height to another, or to elevate the rail between hanger points to gain treadline elevation. See the Rail Section of the TC/American Monorail Systems Catalog for standard notch dimensions.

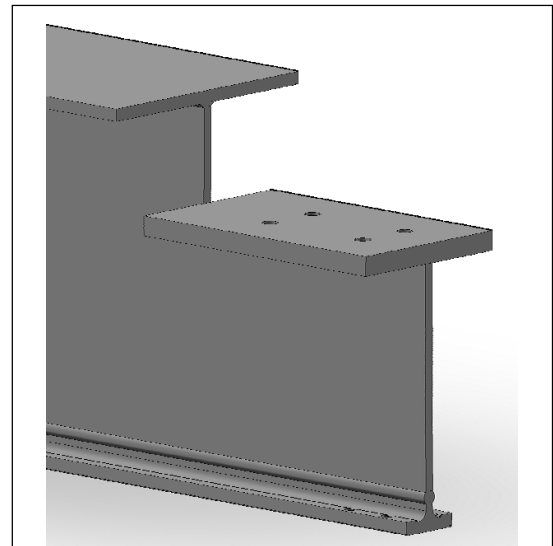
Similar step cuts may be provided on bridge beams where end trucks are mounted.

Figure 30: typical notch at a runway or monorail support point with a 4-bolt hole pattern for connection to overhead steel.

Figure 31: typical notch at an intermediate support point. Use extra handling care on rails with these notches to prevent bending or kinking during installation lifts.



Typical Intermediate Rail Notch
Figure 31



Typical Rail Notch or Step Cut
Figure 30

Rail Web Holes

Holes may be drilled or punched in the rail web to attach mounting brackets for side contact or bottom contact conductor bars, or for various other attachments to the rail web. Locations of holes are referenced from the rail treadline. See rail drawings provided with the shipment. Verify clearances of attachments to trolleys, carriers and end trucks.

Rail Expansion Joints

Rail expansion joint assemblies are used in buildings with an expansion joint in their structure. These are usually found in very large buildings, or where new construction is added to an existing structure. Expansion joint assemblies allow runway or monorails that cross an expansion joint to move with their respective building sections as temperature changes cause expansion or contraction of the structure. Rail expansion joint assemblies are engineered specially for each application. See the drawings provided with the shipment.

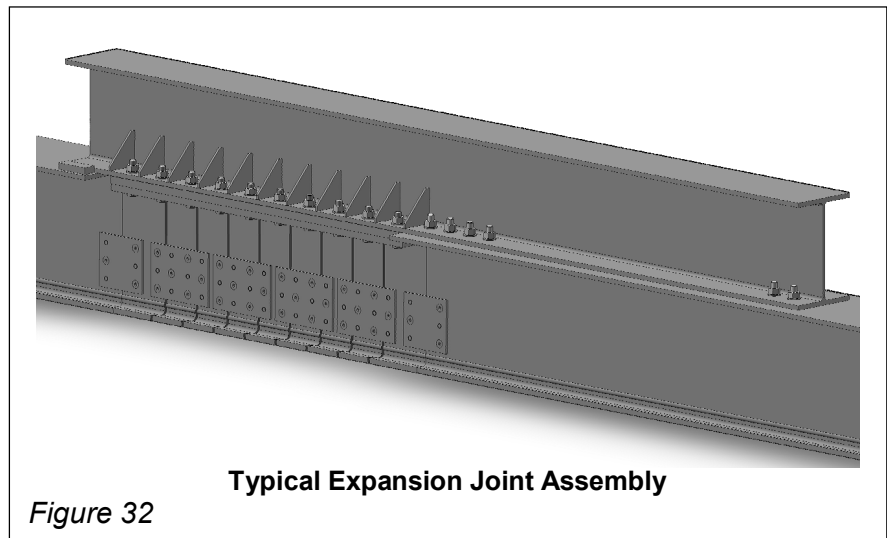


Figure 32

Typical Expansion Joint Assembly

Figure 32: typical expansion joint assembly, with several load carrying rail segments connected to a “strongback” support member. The support and the rail piece shown to the right are attached to the portion of the building at one side of the expansion joint. The rail piece to the left is attached to the portion of the building at the other side of the expansion joint.

In this example, the end of the rail at the left is attached to the strongback support member with a sliding clamp connection. Each rail segment is also held by a sliding clamp connection. The total of the maximum design gap between rail segments is equal to the total building expansion joint design movement.

Rail segments have a special “chevron” cut. This allows them to nest together and aids in maintaining alignment. This cut design progressively transfers the wheel load along the tread as the trolley moves through. Special splice plate assemblies also hold and secure the segments in alignment. Splice plate assemblies are securely attached by splice bolts to alternating rail segments. Splice bolts in the intermediate rail segments are installed in oversize holes with bushings to allow limited movement.

Conductor Bar

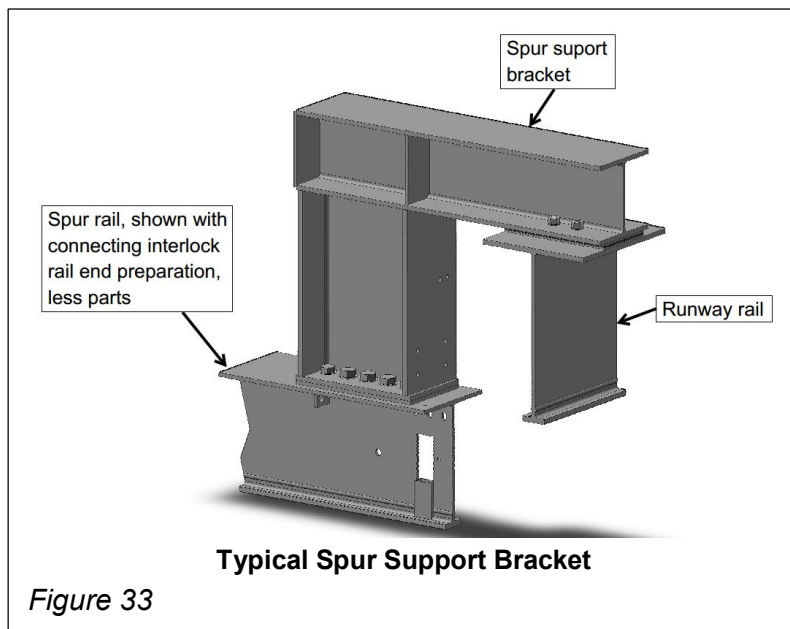
Railway or monorail may be provided with either side contact or bottom contact electrical conductor bars. Choice of styles depends upon the rail model and the application. For additional details on installation of conductor bar on rail, see *Shielded Channel-Bar Electrical Conductor Bar Installation Instructions*, or *Shielded Figure-8 Electrical Conductor Bar Installation Instructions*.

Spur Rail Support Brackets

Figure 33: spur support brackets are used in conjunction with an interlocking crane and a connecting monorail, as shown.

The end of the spur rail is supported by the bracket, which in turn is attached to and supported by the runway rail. This method of support assures that the end of the spur rail will not move relative to the end of the crane bridge, due to runway deflection caused by the loaded crane. This assures crane bridge to spur rail alignment for interlocking.

For additional details on spur supports and interlock installations, see *Interlocks – 325 Series, Installation Instructions*.



Other Rail Options

Many special rail modifications can be provided to meet unique customer or building requirements. Some of these are:

- Special top flange holes or slots (larger than cataloged sizes)
- Special length. 325 Series rails are generally available up to approximately 60' length (based upon standard tee section lengths). Note: this is not applicable to all rail sizes. However, TC/American Monorail has manufactured rails between 90 and 100 feet long. These are used for long bridge girders or long spans on runways and monorails. Note: this is not applicable to all rail sizes. TC/A engineering must review and approve all applications for long beams.
- Special dimension rail. Rails with thicker web, taller or shorter web, thicker or wider top flange, or a combination of all to meet ECL requirements. Also may be used to match old, existing rails.
- "Step Up" at rail ends. Used to match overall rail height of an adjoining rail.
- Tee section notch. May be used where the end of a piece of rail sits on a support member, or for clearance to structure.
- Tie plate assemblies. Special provision at rail end to attach the web of rail to a support structure.
- Dual (tandem) end stops. Sometimes provided with safety tie cables.
- Splice plate assemblies formed to match monorail curves.

Contact the factory for other requests.

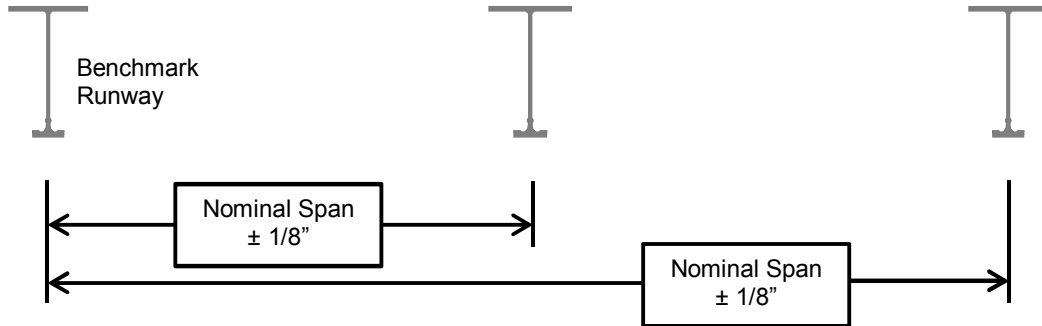
Rail Manufacturing Standards

See the Engineering Section of the TC/American Monorail Systems Catalog.

Runway and Monorail Alignment Tolerances

Note: for these recommendations, first establish a benchmark point and make all measurements relative to that point. Elevation measurements to be made to treadline; span measurements taken at tee section.

Span:



Above tolerance sketch is for two runways, and also for three or more runways. Dimensions measured at hanger points.

Two runways: Benchmark to second run; Nominal span $\pm 1/8''$

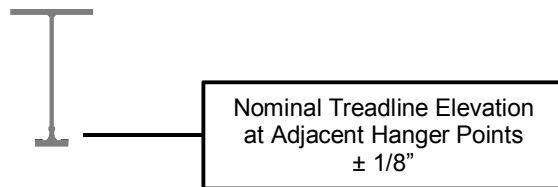
Three or more runways: Benchmark to first interior run; Nominal span $\pm 1/8''$
 Benchmark to third or additional runs; Nominal span $\pm 1/8''$

Straightness:

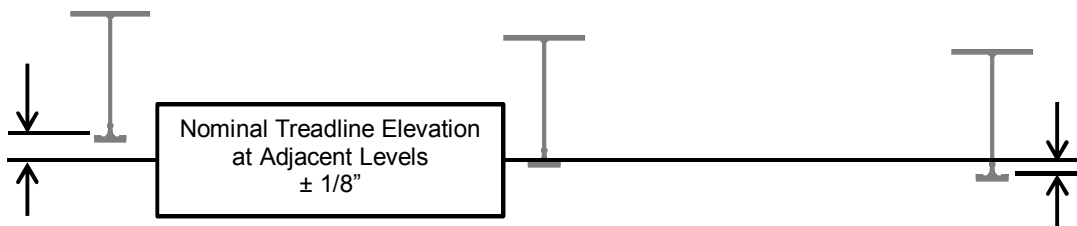


Above tolerance is for straightness of a single line of a runway, or a monorail line, measured at adjacent in-line hanger points. Also applies to overall length of runway or monorail (tolerances do not accumulate over the length of the run). Does not apply to curved monorails.

Elevation:



Above tolerance is for treadline elevation of a single line of a runway, or a monorail line, measured at adjacent in-line hanger points. Also applies to overall length of runway or monorail (tolerances do not accumulate over the length of the run). Does not apply to systems designed to operate on an incline.



Above tolerance is for treadline elevation of adjacent lines of runway, measured at adjacent hanger points.

Inspection Schedule

The following is a recommended minimum inspection schedule for runways and monorails, standard service duty systems. Maintain records of inspections.

Initial Inspection: by installation crew, upon completion of installation. Recommended to be accomplished with observation by owner's representative (maintenance supervisor, etc.).

Check all hardware, complete and tight.

30 Days After Install: by owners maintenance crew, or by contract with installation crew or a service crew.

Check all hardware on rail, splices, end stops, hangers, etc., complete and tight. Replace, adjust or tighten as required.

Each 3 Months: by owners maintenance crew, or by contract with installation crew or a service crew.

Check all hardware on rail, splices, end stops, hangers, etc., complete and tight. Replace, adjust or tighten as required.

Each 6 Months: by owners maintenance crew, or by contract with installation crew or a service crew.

In addition to 3 month check, also check rail for wear.

For rail wear, visually inspect entire system to note any wear (treadline, sides of tee section, rubbing on splice plates or bolts, etc.

Establish a record sheet and take measurements of tee section (see Figure 1 for baseline dimensions) at several locations. Make future measurements at the same locations.

Number and location of measurements will vary with the type of system, and where the majority of crane or carrier movements will be made (i.e., at the center of a monorail or runway as opposed to the far ends). Record measurements on curves as well as straight sections.