

# INDUSTRIAL TRACK CONSTRUCTION SPECIFICATIONS

All track construction shall be governed by these specifications, Engineering Standards, Chief Engineer's Instructions and other drawings incorporated in these specifications. Any items not covered specifically herein shall be in accordance with American Railway Engineering and Maintenance of Way Association ("AREMA") Manual for Railway Engineering, subject to the approval of the Chief Engineer or his authorized representative. Where conflict exists between the AREMA Manual and these specifications, these specifications shall govern. In addition, construction must adhere to all Federal Railroad Administration (USA) or Transport Canada requirements.

These specifications are provided only as a guideline for design and should not be taken as authority to construct without prior review and approval by the office of the Chief Engineer of RailAmerica, Inc. and the General Manager of the railroad involved.

All trackage constructed will require walkways to comply with current and applicable federal, state or local laws. All walkways must conform to the RailAmerica specifications and/or the federal, state, provincial or local regulations whichever is the most protective from the standpoint of the public safety. Industries shall be responsible for the proper construction and maintenance of walkways in the location where tracks are constructed.

These specifications supersede all previous Specifications for Industrial Tracks and are subject to revision without notice.

**Notice: The Railroad reserves the right to have main track turnouts and "Railroad maintained" track installed by its own contractor, with the cost of such construction billed to the Industry.**

OFFICE OF VP - ENGINEERING

*RailAmerica Engineering August 2011*



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## **1. Minimum Safety Requirements For Contractors Safety Instructions (USA)**



Safety of personnel, property, rail operations and the public is of paramount importance in the performance of work. As reinforcement and in furtherance of overall safety measures to be observed while on Railroad property by the Contractor (and not by way of limitation), the following special safety rules shall be followed:

- 1.1 The Contractor shall keep the job site free from safety and health hazards and ensure that its employees are competent and adequately trained in all safety and health aspects of the job. The Contractor shall have the proper first-aid supplies available on the job site so that prompt first-aid services can be provided to any person that may be injured on the job site. The Contractor shall promptly notify the Railroad of any U.S. Occupational Safety and Health Administration reportable injuries occurring to any person that may arise during work performed on the job site. The Contractor shall have a non-delegable duty to control its employees, while they are on the job site or other property of the Railroad, to be certain they do not use, be under the influence of, or have in their possession any alcoholic beverage or illegally obtained drug, narcotic or other substance.
- 1.2 In addition to all applicable OSHA, FRA and other federal or state regulations, Contractors must also have copies of and adhere to the following Railroad policies:
  - 1.2.1 RailAmerica Roadway Worker Protection & MofW Rules (Jan 1<sup>st</sup>, 2010).
  - 1.2.2 RailAmerica Contractor Safety (U.S.A.).
  - 1.2.3 RailAmerica Engineering Safety Rules (2009).
- 1.3 All heavy equipment provided or leased by the Contractor shall operate in compliance with FRA 214 regulations and be equipped with audible backup warning devices.
- 1.4 If, in the opinion of the Railroad Representative, any of the Contractor's or any of its subcontractors equipment is unsafe for use on the Railroad's right of way, the Contractor, at the request of the Railroad Representative, shall remove such equipment from the Railroad's right of way.

## 2. Minimum Safety Requirements For Contractors



### Safety Instructions (CDN)

- 2.1 All personnel authorized to enter upon RailAmerica right-of-way are required to adhere to Safety requirements as set out in RailAmerica Contractor Safety Guidelines (Canadian version) which covers, but is not limited to, the following aspects:
  1. Minimum Protective Equipment (CSA Standards) which must be worn by all personnel on RailAmerica right-of-way consisting of:
    - (a) Protective Headwear (Hard Hat) CSA Z94 1M-1977
    - (b) Protective Footwear (Steel Toe Boots - CSA Grade 1 Certified minimum 6" (150mm) high, laced and with a defined heel )
    - (c) Protective Eyewear (Safety Glasses c/w Side Shields) CSA Z94.3-94
    - (d) Reflective Vest
  2. Rail Traffic Protection - flagging requirements.
  3. Restrictions on Construction operations - this applies to all equipment on the right-of-way.
  4. Requirements for crossing tracks.
  5. Required liability insurance.

**NOTE: The above requirements will be strictly enforced,**



### **3. Check list - Design Information Required**

#### **3.1 Plan View**

- 3.1.1 Geometry (complete curve data including engineering stations or coordinates).
- 3.1.2 Size of turnouts, including weight of rail of existing track, weight of rail of proposed track and turnout curve data for the proposed turnout.
- 3.1.3 Location and type of derail.
- 3.1.4 Type of end of track device (bumping post, wheel stops or earthen bumper).
- 3.1.5 Horizontal clearances to any obstruction within 15' of the centerline of the proposed track.
- 3.1.6 Overhead wire-line crossings should include vertical clearance above top of rail and voltage of line.
- 3.1.7 Underground utility lines should include type of line, depth below base of rail, proposed encasement details and commodity of pipe.
- 3.1.8 Any parallel lines (underground or overhead) in the vicinity of the existing or proposed track, especially FIBER OPTIC CABLES.
- 3.1.9 Drainage devices (size and length) to be installed under existing or proposed tracks, including invert elevations in relation to the top or base of rail. In addition, flow patterns should be shown in the vicinity of all tracks to indicate water control after construction, along with all existing drainage devices in the vicinity.
- 3.1.10 Fences in vicinity of tracks with locations of gates crossing track (engineering station and typical gate section required).
- 3.1.11 Location (engineering station) and clearance to any car pulling devices to be installed along proposed track or other type of car moving equipment to be used.
- 3.1.12 Location, length and type of road crossing surface and the type of warning devices to be installed
- 3.1.13 Location of any under-track unloading structure along with two sets of detailed signed structural plans which should include type of construction, placement and size of reinforcing steel in concrete, thickness of walls and floor, type and size of rail supporting beams (including weight of the beams), weight of rail to be used over the structure and method of fastening the rail to the beams.



- 3.1.14 Location and details of any overhead loading devices, including side unloading racks with drop platforms. Details should include size and location of supports, footings, position locking devices, overhead and horizontal clearance. Clearances from the centerline of track should be shown to indicate dimensions when the device is in use and also in the retracted position for train movement.
- 3.1.15 If any type of track support system, other than the standard "rail on tie plates on wood ties on ballast" is to be used, details must be provided.

### **3.2 Profile**

- 3.2.1 Top of rail of the proposed track including vertical curve lengths, and engineering stations.
  - 3.2.2 Top of rail of the existing track, 200' in both directions from the proposed point of switch.
  - 3.2.3 Description and location of benchmark used in determining elevations.
  - 3.2.4 All drainage devices including invert elevations should be shown on the profile.
  - 3.2.5 Any underground crossings under the proposed track should be shown and referenced to the top or base of rail.
- 3.1 Typical cross section showing sub-grade, walkway and ditch details.
  - 3.2 Stationing of proposed track should begin with 0+00 at the proposed point of switch for each new track.

## **4. Track Design**

### **4.1 Alignment**

- 4.2.1 Horizontal curves of 10° 00' (Chord Definition) (Radius = 573.69') or less, are preferred. Curves greater than 10°00' must have approval of the Chief Engineer, Director of Engineering and the General Manager.
- 4.2.2 A tangent distance of at least 100' between reverse curves or facing point switches is required.
- 4.2.3 Vertical curves shall have a minimum length of 100' and V/L is not to exceed 1.2 for Sags and 2.0 for Summits  
$$\frac{V}{L} = \frac{V(\text{Grade 1}) - V(\text{Grade 2})}{L}$$

L (Length of curve in stations)
- 4.2.4 Grade shall not exceed 2%.
- 4.2.5 Track center minimums are as follows:
  - (a) Tangent Track - 14' minimum
  - (b) On curves, the minimum distance between track center lines shall be increased 2 inches for every degree of curvature.



## 4.2 Turnouts

- 4.2.6 Unless otherwise directed by Chief Engineer or Director of Engineering, No.10 turnouts are required off of all main tracks and located not closer than 300' to a main line curve or bridge. If a new turnout is located within 300' of bridge having no walkway, it is required that a walkway be installed on the bridge.
- 4.2.7 No. 8 or 9 turnouts are recommended for industry track installation from other than main track.
- 4.2.8 Turnouts must be new or relay turnouts of a quality approved by the local Engineering Manager, and to the weight and size specified in 9.1.3 and on the drawings.
- 4.2.9 Turnouts must be constructed in accordance with the Railroad's Standard Plans, copies of which are available from the railroad, or in the absence of a Railroad Standard, from AREMA (AREA) Standard Plans.
- 4.2.10 Switch stands must be new, complete with connecting rods and targets
- 4.2.11 Frogs must be as follows:
  - (a) Main Track - Rail Bound Manganese (RBM) or Spring
  - (b) Yards - Self Guarded Manganese, RBM or Rigid

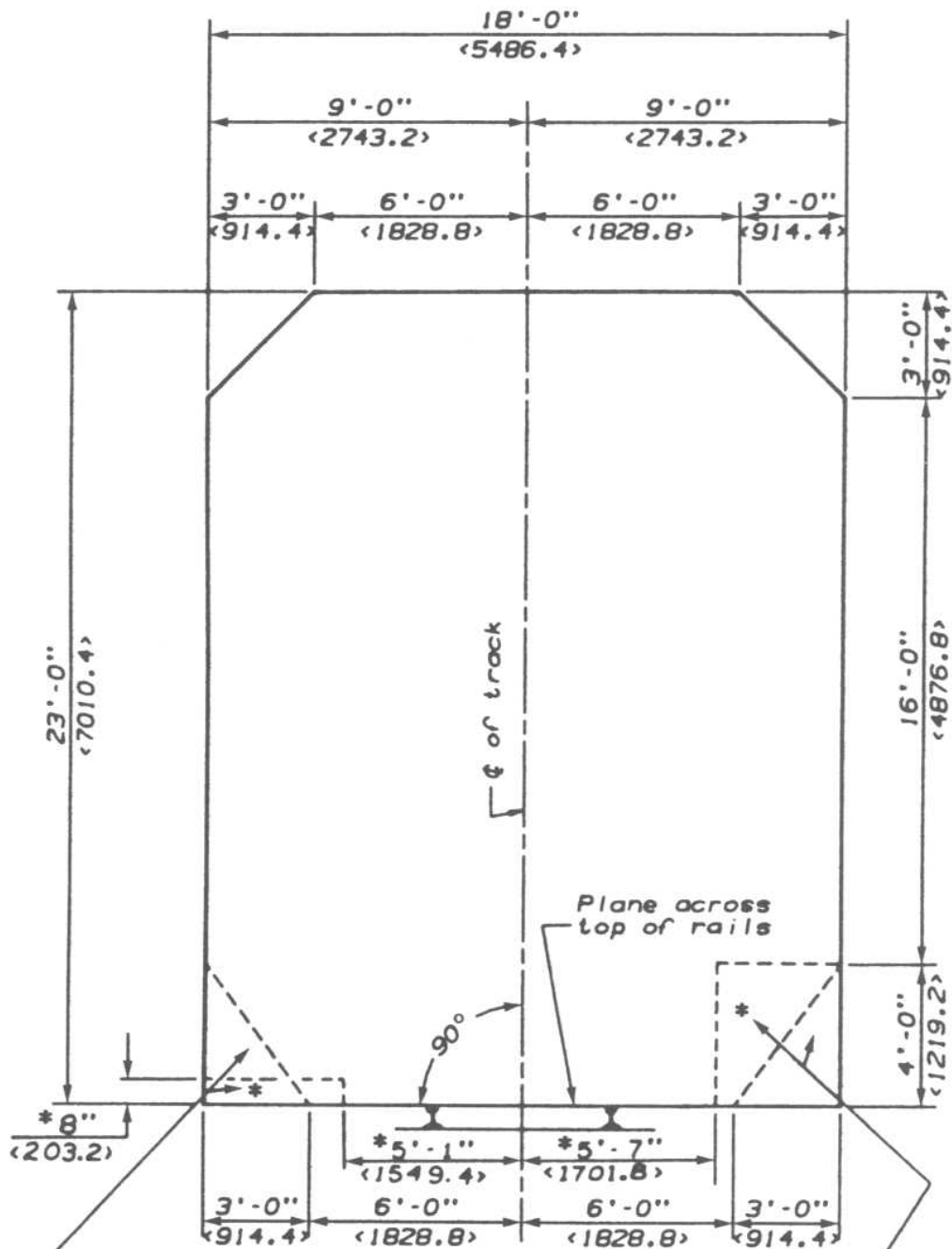
## 5. Clearance Requirements (USA)

### 5.1 Horizontal

The minimum clearance will be 8'-6" from the centerline of track to the nearest obstruction. Horizontal clearances are to be increased 1-1/2" per degree of curve where the facility is located adjacent to or within 80' of a turnout or curve limits.

### 5.2 Vertical

- 5.2.1 23' from top of rail to nearest overhead obstruction.
- 5.2.2 27' from top of rail to overhead wires.
- 5.2.3 27' minimum from top of rail to power lines plus NEA code requirements (usually 27' to 35').
- 5.2.4 5-1/2 feet minimum below base of rail of any track to the top of pipelines, etc. (see RailAmerica General Specifications for Sub-grade and Above-grade Utility Crossings of Railroad Right-of-Way available at [www.railamerica.com](http://www.railamerica.com))
- 5.2.5 Certain states may accept vertical or horizontal clearances slightly less than RailAmerica standards. Management normally will accept the State's lesser clearance requirements, although the Industry will be required to sign an Impaired Clearance Agreement with the Railroad. **In any case, when either horizontal or vertical clearance is less than those of the State Railway or Public Service Commission, the Industry shall secure necessary approval from the appropriate State Authority for each impaired clearance.** The agreement covering service to the Industry's track will include the specific reference to the substandard clearance involved. When State Law requires clearances that are more restrictive such laws will govern.



Only installations necessary for train operations allowed in these areas.

\* Passenger train operations only

TANGENT TRACK

Bracketed dimensions are in mm.

## 6. Clearance Requirements (CDN)



6.1 Unless otherwise authorized in accordance with the STANDARD RESPECTING RAILWAY CLEARANCES, as approved by the Minister of Transport, the following minimum clearances are required on tangent track:

- (a) Vertical: 23'-0" clear headway above the top of the highest rail.
- (b) Horizontal: 6'- 0" from the gauge side of the nearest rail to the nearest part of any structure or obstruction at a height greater than 4'-0" above top of rail, and 3'-7¾" from the gauge side of the nearest rail to the nearest part of any structure or obstruction at a height less than 4'-0" above top of rail.
- (c) Clearances for industrial and private sidings over which the railway operates shall meet or exceed dimensions shown on Diagram # 1.

### 6.1 Track Centers

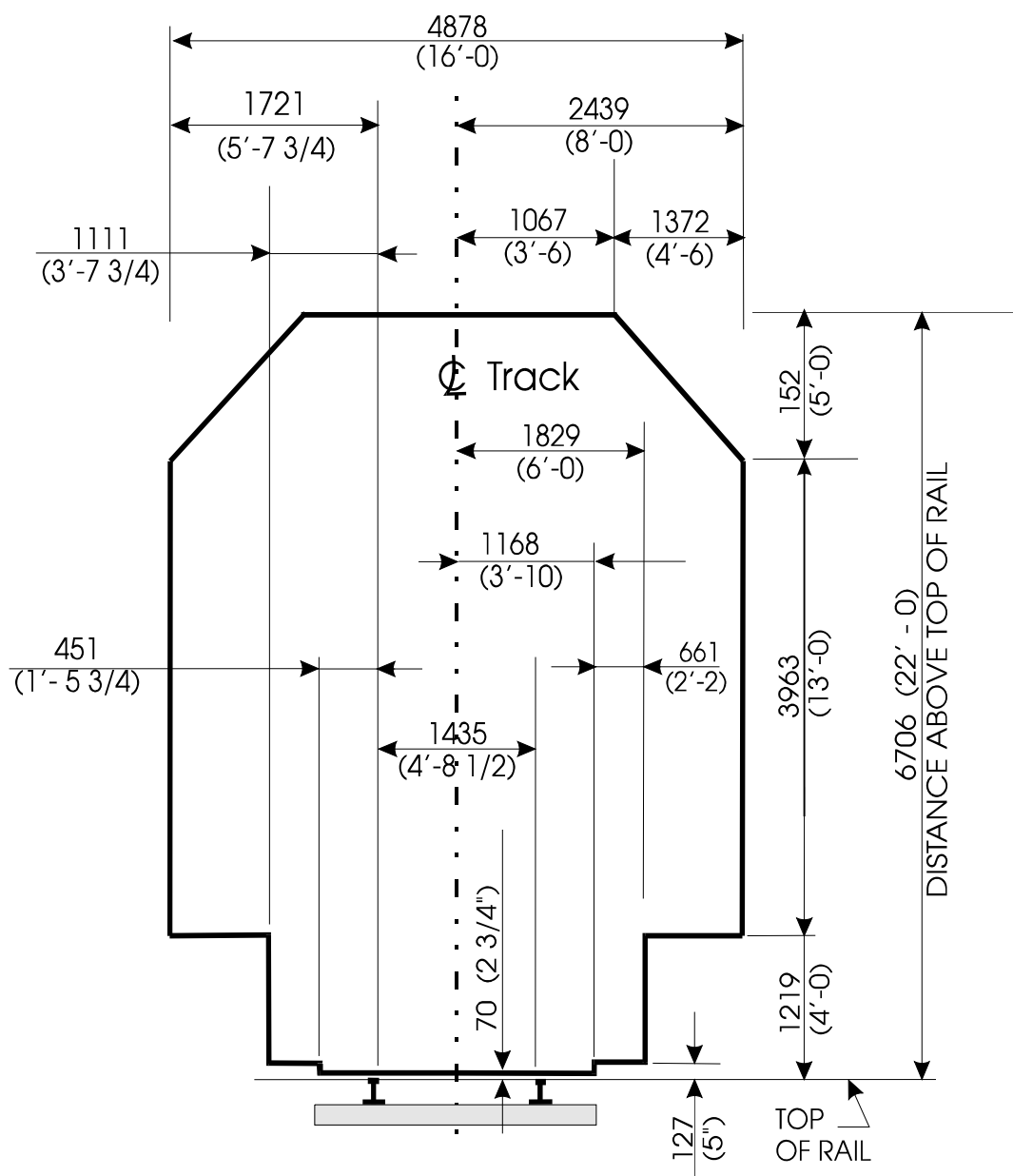
Shall comply with the minimum distances between track center lines with due allowance for superelevation and curvature and shall be as follows:

- (a) Main tracks 3.96 m (13 feet)
  - (b) Main track and siding 4.27 m (14 feet)
  - (c) Main or running tracks and parallel yard tracks 4.24 m (14 feet)
  - (d) Yard tracks 4.11 m (13 feet, 6 inches)
  - (e) Ladder and other tracks 4.57 m (15 feet)
  - (f) Parallel ladder tracks 5.49 m (18 feet)
  - (g) Freight shed tracks 3.66 m (12 feet)
  - (h) Team tracks in pairs 3.66 m (12 feet)
  - (i) Passenger station tracks without platform between 3.96 m (13 feet)
- 6.2 The minimum distance between track center lines shall be increased to account for curvature and superelevation as follows:
- (a) 50.8 mm (2 inches) per degree of curvature of track;
  - (b) Where the superelevation on the outer track exceeds the superelevation of an adjacent inner track, an additional 63.5 mm (2½ inches) per 25.4 mm (1 inch) of difference in curve superelevation between the adjacent tracks. **Example:** Outer track has 2 inches superelevation and the adjacent inner track has 1 inch superelevation on a one degree curve requires tracks to be spread center to center, a total of 4½" greater than on tangent.

**6.2 Non-compliance (Less than standard clearances).**

It is now the Railway's responsibility to ensure its railway permits safe operation. Therefore, should it not be possible to construct to the above clearance measurements, the Engineering Manager should be contacted to review and ensure the proposed encroachment does not impact railway safety and that the appropriate departments (Transportation, Engineering, Clearance Bureau, etc.) and Transport Canada where required are advised of the less than standard clearance.

**Drawing**





**7. Roadbed  
Sub-ballast - Drainage Structures - Walkways**

**7.1 Drainage**

- 7.1.1 Thorough drainage is essential. Every effort must be made to keep the tracks, roadbed and walkways properly drained at all times.
- 7.1.2 All existing and proposed locations of track ditches across and parallel to the proposed track alignment shall be shown on the proposed Profiles of these ditches should also be included on the proposed plans.
- 7.1.3 At track ditch intercepting drains, rip rap or other protection shall be provided to protect the roadbed if necessary, as directed by the Director of Structures.
- 7.1.4 All drainage structures shall be approved by the Director of Structures.

**7.2 Drainage Structures**

- 7.2.1 Culvert pipes - Use of either Class V reinforced concrete or corrugated metal culvert is satisfactory.
- 7.2.2 Installation and use of corrugated metal pipe culverts shall be in accordance with RailAmerica Standards.
- 7.2.3 Minimum size shall be not less than 24" diameter to allow for clean out.
- 7.2.4 All culvert pipe used shall provide for Cooper E-80 design live load.
- 7.2.5 Depth from bottom of tie, to top of culvert shall be as per the following table or AREMA Manual for Railway Engineering Chapter 4.9.5.

**Minimum and Maximum Height of Cover (in feet)**

Pipe Diameter	Gauge thickness of Pipe (2" x 1/2" Corrugation)				
	16 gauge	14 gauge	12 gauge	10 gauge	8 gauge
24"	1-1/2' - 45'	1-1/2' - 50'	1-1/2' - 65'		
30"	2' - 35'	1-1/2' - 40'	1-1/2' - 50'		
36"	3' - 30'	2' - 30'	1-1/2' - 40'	1-1/2' - 45'	
42"	2' - 30'	1-1/2' - 45'	1-1/2' - 70'	1-1/2' - 73'	1-1/2' - 80'
48"	3' - 30'	2' - 40'	2' - 65'	2' - 65'	2' - 70'



- 7.2.6 All pipe shall contain camber when installed.
- 7.2.7 Any reinforced concrete structure designs must be approved by the Director of Structures prior to construction, i.e., concrete box culverts, bridges, under track pits, scale pits, etc.

**7.3 Grading**

- 7.3.1 Width - 24' minimum (22' if approved by Chief Engineer) at sub-ballast level
- 7.3.2 Slopes
  - (a) Fills - 2:1 unless conditions warrant flatter slopes
  - (b) Cuts - Common material not less than 1-1/2:1 (2:1 recommended)  
Sound rock: 1/4:1
  - (c) Side Ditches - will have a flow line at least 2' or more below finished sub-grade. Flow line width shall be at least 2', or more, as conditions warrant.
  - (d) Compaction - The construction sub-grade shall be stabilized to a minimum depth of 6" with lime or cement depending on the results of the soils tests, and compacted to not less than 95% of the maximum density, and to within +/- 2% of the optimum moisture content, as determined by ASTM D 1557 (Modified Proctor Testing Procedures).

**7.4 Sub-Ballast - Materials**

- 7.4.1 Sub-ballast shall consist of a foundation course for a typical railroad roadbed and shall be composed of either caliche, argillaceous limestone, conglomerate, crushed or screened pit run gravel, crushed slag or other granular materials containing no more than 3% organics by weight as determined by ASTM C-123.
- 7.4.2 The materials shall meet the requirements hereinafter specified. Aggregate retained on a No. 10 sieve shall consist of hard, durable particles or fragments of stone, gravel, sand or slag. Materials that break up when alternately frozen and thawed or soaked and dried shall not be used. Allowable wear, based on the Los Angeles Abrasion Test, shall not be greater than 50%. A higher or lower percentage of wear may be specified by the Chief Engineer.
- 7.4.3 Gradations  
It is the intent of this specification that the sub-ballast shall consist of gradations as set forth in the following table:

<b>SIEVE SIZE</b>	<b>2"</b>	<b>1"</b>	<b>3/4"</b>	<b>No. 10</b>	<b>No. 40</b>	<b>No. 200</b>
% PASSING (OPTIMUM)	100	95	67	38	21	
% PASSING (PERMISSIBLE)	100	90-100	50-84	26-50	12-30	0-10



7.4.4 Design Requirements

Sub-ballast will be used as indicated by the following charts or as directed by the Chief Engineer/Director of Engineering

EIGHT INCHES (8") OF SUB-BALLAST IS REQUIRED - NO FINER THAN THE GRADATIONS LISTED BELOW.

PERCENT PASSING (BY WEIGHT)	SIEVE SIZE NO. OF MESH PER INCH	GRAIN SIZE IN MM
19	200	.08
74	100	.16
92	60	.26
100	40	.42

TWELVE INCHES (12") OF SUB-BALLAST IS REQUIRED WHERE SUB-GRADE MATERIALS HAVE A GRADATION SMALLER THAN LISTED ABOVE.

7.5 Sub-Ballast Construction

7.5.1 Preparation of Subgrade

The roadbed shall be shaped in conformity with the typical sections shown on plans and to the line and grades provided by the Engineering Manager. All unstable or otherwise objectionable materials shall be removed from the sub-grade and replaced with approved material. The sub-grade shall be in an acceptable condition to receive the sub-ballast material.

7.5.2 Lift Thickness

The sub-ballast shall be constructed in two or more lifts of approximately equal thickness. The maximum compacted thickness of any one lift shall not exceed 6" and shall be compacted to not less than 95% of the maximum density and to within ± 2% of the optimum moisture content, as determined by ASTM D 1557.

7.5.3 Compaction

If the material is laid and compacted in more than one lift, the Contractor shall plan and coordinate his work in such a manner that the previously placed and compacted lifts be allowed ample time for curing and development of sufficient stability before vehicles hauling materials for the succeeding lifts, or other heavy equipment, are permitted on the sub-ballast. Prior to placing the succeeding lifts of material, the surface of the lower lift shall be sufficiently moist to insure a strong bond between the lifts. The edges and/or edge slopes of the sub-ballast shall be bladed or otherwise dressed to conform to the lines, grades and dimensions shown on the plans.

**Ballast specifications vary by Railway and are to be attached as appendix.**

## 8. Walkways



### 8.1 Safety

Walkways shall be constructed and maintained to provide a reasonable regular surface and shall be maintained in a safe condition clear of vegetation, debris, standing water and other obstructions which constitute a hazard.

### 8.2 Grades and Slopes

Walkways shall not have a grade and slope in excess of approximately 1" of elevation per 8" of horizontal length in any direction. Excess slope is permissible where the proximity of adjacent tracks so dictates, so long as the slope between tracks is constant.

### 8.3 Construction

Walkways shall be constructed to a minimum width of 8'-6", as measured from the centerline of the track. It shall be constructed and maintained in such a manner that the elevation of its surface is at least level with the top of the ties.

### 8.4 Requirements

Walkways shall be located along sides of the tracks for a minimum distance of 15 feet on each side of every switch stand or other track-side switch throwing mechanism. Walkways are required around all derails equipped with switch stands.

### 8.5 Minimum Distances

Walkways shall be continuous and maintained from the switch stand through the switch frog and along the diverging tracks to a point at least 25' beyond the clearance point of the switch. An additional 3' of walkway width shall extend for a minimum distance of 4' in each direction from the switch stand or other track-side throwing mechanism on the side of the track where said mechanism is located. This additional 3' of width shall be gradually tapered back to the 6' minimum width in a distance of not less than 20'.

## 9. Track Material

### 9.1 Rail

- 9.1.1 Rail used in Industrial tracks must be 100lb. or greater (see note regarding consideration of 90lb. rail)\*
- 9.1.2 Part worn or "relay" rail may be used in all locations except turnouts, provided it meets the following standards:
  - (a) Only lengths of 39, 36, 33, and 30 are acceptable
  - (b) Rail may have minor imperfections in line and/or surface, or minor physical defects, which in the opinion of the Roadmaster or Engineering Manager, will not interfere with the safe use of the rail for the service intended.



(c) Rail must be within the following limits of wear: AREMA CLASS II

Rail Weight	Loss of vertical height	Flange Wear	Rail end batter
<b>100</b>	3/16"	1/4"	1/8"
<b>110</b>	5/16"	1/2"	1/8"
<b>112</b>	5/16"	1/2"	1/8"
<b>115</b>	5/16"	3/4"	1/8"
<b>132</b>	5/16"	3/4"	1/8"

- 9.1.3 Turnout rail in mainline must be new 115lb rail (minimum) extending to the clearance point. If adjoining rail is larger than 115lb., the turnout rail must match or exceed that size. Relay material may only used on main line turnouts when approved by the Railroad. Maximum head loss and gauge face wear 1/16".
- 9.1.4 Track expected to handle dangerous commodities shall be constructed with rail that has been control cooled.
- 9.1.5 *\*Subject to prior consent of the Railroad, and upon written request of the owner, 90lb. rail may be acceptable for some installations.*

**9.2 Other Track Material**

- 9.2.1 Track Spikes to be new (or approved relay) 5/8" x 6" (Section 10.4 "Track Construction spiking patterns). **Note: 10.4 spiking pattern "Spec #3" is to be used for 15 ties ahead of switch points.**
- 9.2.2 Track Bolts & Washers will be new, and appropriately sized for the bolt holes in the rail section with sufficient length to allow a spring washer and full nut threaded on the bolt.
- 9.2.3 Rail Anchors to be box anchored on every 3<sup>rd</sup> tie (as per 10.3.6). No anchors will be installed at the joint, or the rail opposite the joint. **Turnouts** will be fully box anchored except within the point area and extend 200 feet in front of points and beyond the last long tie.
- 9.2.4 Tie Plates (new or approved relay) 7-1/2" x 11" or 7-1/2" x 14".
- 9.2.5 Splice Bars (new or approved relay) must match the rail section being used and either 4-hole or 6-hole.
- 9.2.6 "Forged" Compromise Bars will be utilized when rails of different rail sections are connected. The compromise bars will be of the proper size and type for the rail sections being joined.

### **9.3 Track Ties**

All track and turnout ties on Railroad maintained portion shall be new. (Upon approval from Chief Engineer, Relay track ties will be considered for the industry maintained portion in lieu of the following specifications)

- 9.3.1 New creosoted oak, mixed hardwood, Fir or Pine ties spaced at 21" center to center are recommended for light traffic conditions. Dimensions of 8'6" in length by a cross section 6" to 6-1/2" by 8" to 8-1/2"
- 9.3.2 New creosoted oak, mixed hardwood or Douglas fir ties spaced at 20" are recommended for medium traffic conditions. Dimensions of 8' 6" in length by a cross section 7" to 7-1/2" by 8-1/2" to 9"
- 9.3.3 New creosoted oak, mixed hardwood or Douglas fir ties spaced at 20" center to center are recommended for heavy traffic conditions. Dimensions of 9 feet long by a cross section 7" to 7-1/2" by 8-1/2" to 9"
- 9.3.4 Tie treatment is to be in accordance with current industry practice and AREMA Manual for Railway Engineering.
- 9.3.5 On Industrial Grade ties, the corners may be bevelled, provided the minimum flat surface on top or bottom is 7 inches.
- 9.3.6 The use of alternative cross tie or switch tie materials (concrete, steel, composite) will be considered on a case by case basis. The use of these ties must be approved by the track owner and RailAmerica Chief Engineer/Director of Engineering.

### **9.4 Special Tie Considerations**

- 9.4.1 Track ties to be installed under road crossings where timber crossing planks are specified, to be 9 feet in length, with cross-section dimensions of 8'6" to 9' in length by 7" to 7-1/2". Some corners may be bevelled provided the minimum flat surface on top or bottom is 7-1/2".
- 9.4.2 Track Ties to be installed under road crossings where asphalt surface, concrete or rubber planks are specified, ties will be of dimensions and spacing as directed by the Railroad Engineering Manager, Roadmaster or as recommended by the crossing system manufacturer/supplier.

### **9.5 Switch Ties**

- 9.5.1 Switch ties to be new oak, mixed hardwood or Douglas fir, creosote pressure treated. Concrete or steel ties are acceptable.
- 9.5.2 Switch ties to be supplied in strict accordance to the bill of materials on the appropriate AREA plan.



### 10. Track Construction

Track Laying and Surfacing shall be supervised by experienced personnel skilled in railroad track construction.

#### 10.1 Rail

10.1.1 Rails shall be unloaded, stored and distributed along the roadbed in such a manner as to prevent damage.

10.1.2 Before rails are laid, maintain grade to a good surface and keep ties in alignment.

10.1.3 Do not mix rails of different manufacturers and/or weights in any stretch.

10.1.4 Lay rails with staggered joints, the stagger between joints in opposite rails being not less than 12 feet except as otherwise authorized by the Railway.

10.1.5 Lay rail within the minimum gaps as indicated on the following chart. Use fiber or hardwood shims for obtaining a proper expansion space. Do not remove expansion shims until the rail is properly spiked, bolts tightened and the rail anchors applied.

RAIL TEMPERATURE	33' RAIL GAP	39' RAIL GAP	78' RAIL GAP
Below 25°F	1/4"	1/4"	1/2"
25° to 50°F	1/8"	3/8" every other joint	3/8"
51° to 75°F	1/8" every other joint	1/8"	1/4"
76° to 100°F	1/8" every other joint	1/8" every other joint	1/8"
Above 100°F			1/8" every other joint

10.1.6 Lay partly worn rail in the same position it occupied before removal from the previous trackage so that the gauge side remains the gauge side.

10.1.7 Anchor rails immediately after laying.

10.1.8 Place splice bars and tighten bolts before spiking the rail.

10.1.9 Tighten bolts in the rail joints in the following sequence:

- the two bolts at the center of the bar,
- the second bolt from the end of each rail,
- the third bolt from the end of each rail.

10.1.10 Gauge of track after laying must be uniform and set at 4' 8-1/2". If extra width in gauge is required on sharp curvature, it will be determined by the Railway.

10.1.11 When new rail adjoins rail previously in track (or at any mismatch of rails, in the opinion of the Railway) build up the rails by welding.

- 10.1.12 Use rail saws and rail drills only for cutting and drilling rail respectively.
- 10.1.13 Do not use welding equipment to cut rail or drill holes in rail, under any circumstances.

## **10.2 Ties**

- 10.2.1 Ties shall be placed with the heartwood side down at right angles to the rail and centered with respect to the adjacent ties. Ties shall be centered with respect to the centerline of the track. Ties shall be uniformly spaced center to center of tie. Spike holes must be plugged when re-spiking ties.
- 10.2.2 Ties shall be handled in such a manner as to avoid breaking or bruising. Ties shall not be thrown from cars or trucks onto rails or rocks.
- 10.2.3 Tie tongs or other suitable devices shall be used for handling ties. Use of bars, chisels, forks, mauls, picks, shovels or sledges for replacement of ties beneath the rails will not be permitted.

## **10.3 Plates and Anchors**

- 10.3.1 Tie plates used shall be double shoulder on all track and turnouts. Do not mix together tie plates having different slopes in the same stretch of track.
- 10.3.2 The bottom of the rail and tie plates shall be cleaned before the rail is laid.
- 10.3.3 Tie plates shall be applied at the time the rail is laid to avoid unnecessary spiking. Plate shoulder shall bear against the outside base of the rail, centered on the tie with a flat, uniform bearing on the tie, and so that the rail cant is inward.
- 10.3.4 No portion of the shoulder of the tie plate shall be under the base of the rail
- 10.3.5 Rail Anchors shall be used on all track and through turnouts, where they do not interfere with the operation of the switch points. They shall be of the same type on any one tie and of a size for the rail section they are designed.
- 10.3.6 Rail Anchors shall be installed as follows on the gauge side of the rail:
  - On Jointed Tangent Track (max. 39' rails) - box every third tie
  - On Jointed track (78' rails), CWR and Curves - box every second tie
  - On Turnouts - box every tie (both main and diverging track) and for 200 feet ahead of points and beyond the last long tie.
- 10.3.7 Anchors shall be applied with the proper tool ensuring they are not overdriven.
- 10.3.8 Anchors shall not be applied on ties which support rail joints, where they will interfere with bond wires or other signal appliances, or where they will be inaccessible for adjustment or visual inspection.

**10.4 Spiking**

- 10.4.1 Space ties properly and square to the rail, before driving spikes.
- 10.4.2 Use a Standard Spike Maul or machine to drive spikes.
- 10.4.3 Drive the spikes with the head pointing to the rail, except at splice bars and other locations where they are not holding down the rail.
- 10.4.4 Start and drive spikes vertically, and square, to provide a full bearing against the edge of the base of the rail.
- 10.4.5 Do not drive spikes to contact the top of the base of rail. Drive them so as to allow not more than 3/16 inch clearance between the underside of the head of the spike and the top of the base of rail.
- 10.4.6 Use properly adjusted stops on power operated spiking machines.
- 10.4.7 Do not strike the rail, fastenings or signal appliances with the spiking tool when spiking. Do not drive spikes against the ends of splice bars. Do not drive spikes in the slots of slotted splice bars.
- 10.4.8 The number of spikes to be used as follows:

Spec #1 - Tangent & Curves less than 2°



Spec #2 - Curves 2° and less than 4°



Spec #3 - Curves 4° and less than 6°



Spec #4 - Curves 6° and over



- 10.4.9 When 2 spikes per tie are used, where possible, stagger them so that the field side spikes are on the same side of the same tie and the gauge side spikes are on the other side of the same tie.

## **10.5 Turnouts**

- 10.5.1 Turnouts shall be constructed of all new or good secondhand rail and other track material. Unless otherwise approved by the Chief Engineer, all turnouts must be fabricated to AREA standards. Install turnouts in accordance with the Standard Plans provided.
- 10.5.2 The straight rail in the turnout shall be spiked first, the closure rail with the proper offset from the straight rail shall be set then the turnout rail will be gauged and spiked in position in its proper relation to the end of the ties. Curved track shall be spiked to gauge 4' 8-1/2" with no allowance for increasing the gauge. Curves should have a minimum of one anchor spike on the field side of the rail (opposite the field gauge spike) if the plate will allow.
- 10.5.3 Using an approved rail bender, bend the turnout stock-rail horizontally, as shown on the standard plan. Rail bender to be approved by the Railroad's Engineering Manager.
- 10.5.4 Ensure that switch point fits snugly against the stock rails for the entire length of the planed portion.
- 10.5.5 Provide washers and cotter pins for bolts, as required by applicable TS Plans.
- 10.5.6 Only adjustable rail braces are acceptable.
- 10.5.7 Install switch rod bolts and connecting rod bolts, except the bolt under the switch stand, with the nut on the upper side to permit ready inspection of the cotter pin. Install the connecting rod bolt under the switch stand with the head on the upper side.
- 10.5.8 Position the handle on table top style switch stands so that when the switch is in the normal position it faces away from the frog and the track, and moves in the same direction as the points when the switch is lined for the diverging route.
- 10.5.9 Leave points spiked or clamped until approved by the Railroad's Engineering Manager.

## **10.6 Surfacing and Lining**

- 10.6.1 Ballast Distribution: Place and distribute the ballast in sufficient quantities on trackage and turnouts to achieve the required lift, as determined by the grade of the stakes, and to conform to the ballast sections as shown on the Standard Plans provided.



- 10.6.2 Ballast shall be spread and the track raised in a series of lifts to the required height as indicated by the tolerances. No single lift shall be higher than 4". In raising track, jacks or equipment shall be so regulated as to avoid bending of angle bars or straining of joints. jacks shall be simultaneously used and properly spaced at not more than quarter points of the rail to avoid breaks or bends in the rail when the track is being raised.
- 10.6.3 Tamping will not be permitted at the middle of the tie where ballast is to be left to settle of its own accord. Both ends of a tie shall be tamped simultaneously and tamping inside and outside the rail shall be done at the same time.
- 10.6.4 Load, distribute and place the ballast using rubber tired or high rail equipment, or railway ballast cars. The Contractor is cautioned that damage caused by his equipment to track and turnouts during the distribution of ballast will be repaired by the Contractor at his expense, as directed by and to the satisfaction of the Railroad. Use caution when handling ballast with loaders to ensure minimal contamination with soils and fines.
- 10.6.5 Ensure that track ties are spaced correctly, and at right angles to the rail, prior to unloading of ballast.
- 10.6.6 Lifting and Lining: Raise all trackage and turnouts with the ballast to provide a minimum depth of eight (8) inches from the bottom of the tie to top of sub-ballast or to a depth directed by the Railroad. Where necessary, the Railway will advise on the amount of superelevation required on curves. Use tamping machines or other mechanical tamping equipment approved by the Railway to tamp the ballast. For 8 foot ties, tamp both sides of ties from a point 16 inches inside each rail to the end of the ties.
- 10.6.7 Tamp turnout ties firmly for 16 inches on either side of the mainline and turnout rails. Tamp by hand the areas under the frog, guard rails and heel castings, using bars or mechanical hand tampers.
- 10.6.8 Hand tamping to be permitted only where power or mechanical tamping is not possible.
- 10.6.9 Line all trackage and turnouts to conform to the drawings.

## 11. Miscellaneous Track Work

### 11.1 Derails

11.1.1 Install derails at the location specified by the Railway dependent on track gradient, location and use.

11.1.2 The physical location for derails is governed by local conditions such as grade and length of track, however shall never be located less than 50 feet behind the clearance or “fouling point” with the protected track. Where practical, derails should be located 100 feet from the clearance point, but in any case at a location that a derailed car could not continue to move foul of the protected track after being derailed.

If the derail must be located close to the clearance point, a bent guardrail must be installed between the rails to provide additional assurance that the equipment will not foul the protected track.

11.1.3 The type of derail to be used is determined by the following conditions:

Hinge and sliding type derails may be used where the speed of the equipment to be derailed will not exceed 15 MPH.

Sliding derails are to be used at locations where power operation is required.

A switch point derail shall be installed where;

**(a) The grade of track is 0.5% or greater; or**

**(b) The equipment to be derailed could exceed 15 MPH at the location of the derail; or**

**(c) There is a private locomotive or shuttle used to move equipment**

11.1.4 Install derail marker post at all derails. **Note: All derails are to be yellow. If not supplied in that manner, they shall be painted yellow prior to installing.**

### 11.2 End of Track Devices (Bumping Posts, Stop Blocks)

11.2.1 End of track devices will be as approved by the General Manager. Devices such as earth and tie bumper, wheel stops, or bumping posts such as Hayes type heavy duty post may be used. All bumping posts or stops shall be sized for the rail section being used in track. Consideration should be given to allow adequate space between the last car spot and the bumping post to allow the car to be coupled into without striking the bumping post.

11.2.2 Install bumping posts, car stops or sand boxes as specified on the plans submitted and in accordance with the manufacturer's instructions. Install car stops and bumping posts 10 feet from the end of the track, with 10 ties in front of, and all ties behind, fully anchored.



### **11.3 Road Crossings**

- 11.3.1 Install crossings only at the locations shown on the drawings. Crossing surface to be as specified by the Railroad.
- 11.3.2 Only fully planked timber, concrete, asphalt or solid rubber planking will be accepted. Planks to be the full depth of the crossing to match the height of the rail, to a maximum of seven inches. Rubber flangeway material is preferred for asphalt and concrete surfaces.
- 11.3.3 For timber surfaces, provide a flangeway space of not more than 3 inches nor less than 1-7/8 inches deep, and not less than 2-1/2 inches or more than 4-3/4 inches wide.  
**NOTE: Flangeway clearances may fall under State, Provincial, or Federal Regulation. Flangeways must be constructed as per the policy or regulation applicable.**
- 11.3.4 Fasten timber planks with 1/2" x 12" lag screws, with one fastening in every third tie and ends. Countersink planks for recessing of the washer and the lag bolt head.
- 11.3.5 Trim the ends of the planks parallel to the road centerline to the width shown on the drawings and bevel the ends of the planks
- 11.3.6 Keep joints clear of crossings. Where practicable, do not locate joints closer than 10 feet to the crossing surface. Where the width of crossing necessitates, replace jointed rail with welded rail.
- 11.3.7 Public crossings to be constructed in accordance with applicable Federal, State or Provincial regulation.**



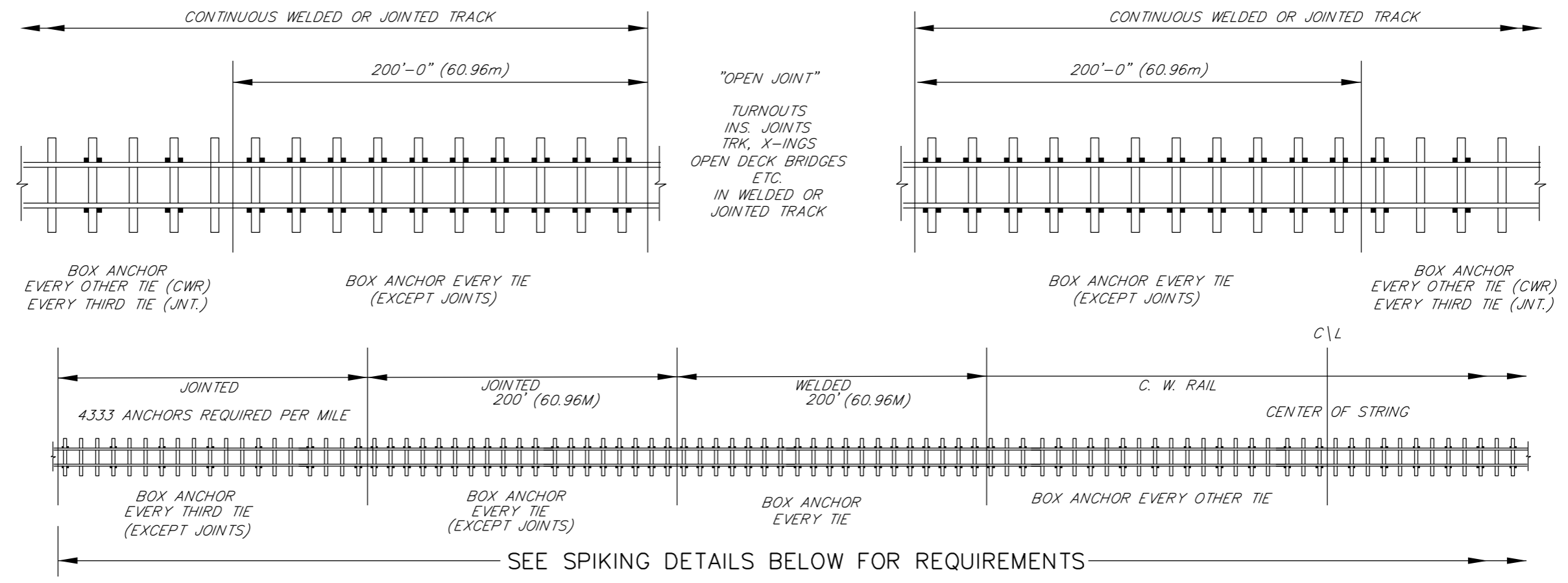
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## 12. APPENDIX

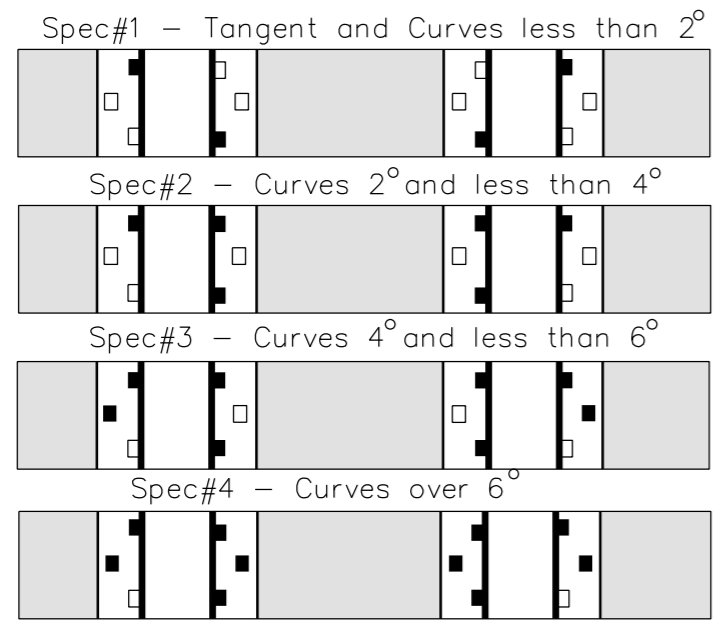
**All applicable plans, drawings, specifications, clearances and Federal, State or Provincial regulations to be attached as appendices.**

**Attached:**

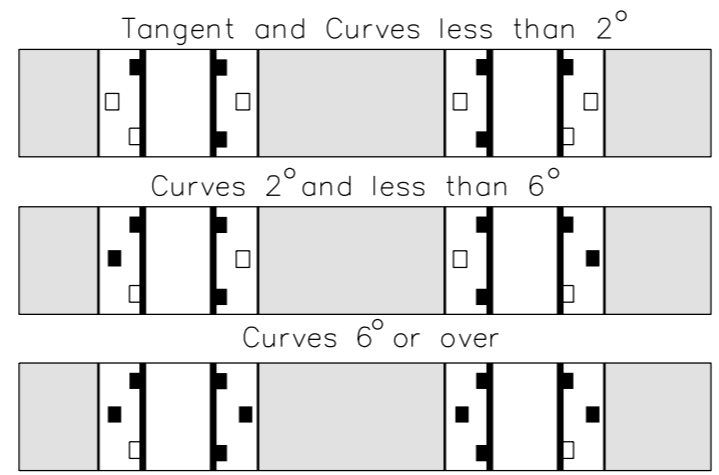
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ES8050.1	
REVISIONS	
11-15-2010	TJF/XRL
06-28-2011	TJF/XRL



**SPIKING PATTERNS – JOINTED TRACK**



**SPIKING PATTERNS – CWR**



NOTES:  
 ON JOINTED RAIL ABUTTING A COMPLETED LENGTH OF CONTINUOUS WELDED RAIL, 200' IN EACH DIRECTION MUST BE FULLY BOX ANCHORED (EXCEPT JOINT TIES) AND THEREAFTER EVERY THIRD TIE MUST BE BOX ANCHORED. OTHER REQUIREMENTS MAY APPLY (PROJECT SPECIFIC).  
 REQUIRED TIE SPACING IS 19 1/2" (.495m).  
 FOR BALLAST AND SUB-GRADE REQUIREMENTS SEE ES 8051.1.  
 80' JOINTED RAIL LENGTHS WILL BE ANCHORED PER CWR STANDARD.

( ) = METRIC CONVERSION