Technical Requirements

Track Renewal & Grade Crossing Upgrade Project

For the
Central Florida Rail Corridor

Florida Department of Transportation

District 5

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1. Technical Requirements

These technical requirements establish the requirements for the Track Renewal & Grade Crossing Upgrade Project to furnish (excluding some ties and rail), distribute, and install rail, ties, concrete panel highway grade crossings, pedestrian grade crossings, ballast, and other related items of work within the Central Florida Rail Corridor (CFRC). The construction project is located between DeBary and South Orlando, FL, between MP A761.81 and MP A796.63. The work shall include the furnishing of all the necessary tools, equipment, labor, materials, insurance, plans, permits, etc. necessary for the installation of rails, ties, highway grade crossings, pedestrian crossing tie replacement, and other items necessary to complete the work in accordance with the CFRC Maintenance of Way Instructions (MWI) attached as Appendix D, this project's FDOT Specifications, and the other Contract Documents.

1.1 Track Renewal

The track renewal work consists of replacing jointed rail and older Continuous Welded Rail (CWR) with new 115RE & 132RE CWR, replacing wood crossties, and replacing crossties under concrete pedestrian crossing panels with ten foot ties. For all track renewal work, existing anchors shall not be reused, new knock on anchors shall be furnished and installed. The Contractor shall supply and use a dynamic track stabilizer to minimize slow orders. Slow Orders shall comply with CFRC MWI 1109 – Temporary Speed Restrictions.

A) Rail

The Department will furnish some of the rail for the project. See Section 3, Materials of this Technical Requirements for a breakdown of materials to be furnished by the Department. The remaining materials are to be furnished by the Contractor. The Contractor shall furnish, distribute, and install all other materials (insulated joints, other track material (OTM), welds, etc.) as necessary to complete the work. The rail sticks shall be flash butt welded to the lengths needed and field welded using thermite welds. Flash butt welding and field welding shall comply with CFRC MWI 801-06 – CFRC Welding Manual. Rail stockpiles are located at the following locations:

- MP 762.4 - North of Barwick Road, East of Track 2
- MP 766.6 – South of McCracken Road, West of Track 1
- MP 788.5 – South of Virginia Avenue – East of Track 2
- MP 790.6 – South of South Street – East of Track 2

No permanent rail joints will be permitted. Rail shall be installed before the ties so as not to spike kill the ties. Appendix A lists the location of CWR replacement and approximate quantity to be installed. The locations will be identified in the field by the Engineer. All insulated joints not shown to be replaced shall remain in track or be reinstalled following CWR installation. The Contractor shall be responsible for the removal of rail and OTM in accordance with local, state, and federal environmental regulations.

B) Ties

The Department will furnish a portion of the ties. See Section 3, Materials of this Technical Requirements for a breakdown of ties to be furnished by Department. The Contractor shall furnish all other material necessary to complete the Technical Requirements. The Contractor shall furnish, distribute, and install all other materials (OTM, tie plugs, etc.) as necessary to complete the work. The CFRC furnished ties are located at the following locations:

- MP 778.9, East of Track 2 - North St laydown yard
- MP 789.3, West of Track 1 – Colonial Drive laydown yard

Appendix B shows the tie quantities and approximate locations of installation. Ties requiring replacement shall be field identified by the Engineer.

C) Ballast

Shy ballast conditions exist from MP A782.8 to MP A791.9. The Contractor shall purchase, unload, distribute, tamp and regulate the amount of ballast required to bring the ballast section into conformance with the main track standard ballast section in accordance with CFRC MWI 2602 – Ballast Sections. Ballast shall be in conformance with AREMA gradation 4A. For bidding purposes, this quantity is estimated to be 5,000 tons. Ballast work is required for the following segments.

- MP 782.8 to MP 784.7 – Single Track (1.9 track miles)
- MP 784.7 to MP 791.9 – Double Track (14.4 track miles)

D) Pedestrian Crossing Tie Replacement

Pedestrian crossings at the SunRail stations were previously installed using 8.5 foot crossties and a tie parallel to the rail to secure the lag bolts of the crossing panel. The photograph below shows the existing condition of ties at the pedestrian crossings.

At the locations listed below, the Contractor shall remove the asphalt adjacent to the crossing, remove the crossing panels, replace the existing ties with ten-foot ties, and replace and secure the concrete panels and replace the adjacent asphalt.

- South End DeBary Station
- North End Sanford Station
- South End Sanford Station
- South End Lake Mary Station
- North End Longwood Station
- North End Altamonte Station
- South End Altamonte Station
- North End Maitland Station
- South End Maitland Station
- North of Morse Blvd
- South of Morse Blvd
- North End Florida Hospital Station
- South End Florida Hospital Station
- North End LYNX Station
- North End Orlando National Railroad Passenger Corporation (Amtrak) Station
- Orlando Amtrak Station South of the Mini-Hi's
- Orlando Amtrak Station at Amtrak Building
- Middle Orlando Amtrak Station
- North End Sand Lake Road Station
- South End Sand Lake Road Station

Existing ties removed from the pedestrian crossings shall be stockpiled by the Contractor at the Department's Vehicle Storage and Maintenance Facility (VSMF) laydown yard in Sanford.

E) Utility Coordination

The Contractor shall be responsible for maintaining all existing utilities within all work zones. The appropriate utility coordination is the responsibility of the Contractor. The Contractor shall coordinate all rail and tie installation with the Engineer who will be responsible for coordinating with CFRC Signal Maintenance of Way Contractor, Herzog Technologies, Inc., for the necessary signal support to identify, locate, protect, and restore all signal cabling, insulated joints, jumpers, and other items.

The Contractor shall follow Department standards, policies, and procedures for utility coordination. The Department standards, policies, procedures, and design criteria are contained in this project's FDOT Specifications, Rule 14-46.001 (Utility Accommodation Manual), Utility User's Guide, and the Contract terms and conditions. Preliminary review of Utility Compensable Property Interest has indicated that the following Utility Owners may be eligible for reimbursement, should relocation be required.

- CFRC Wayside Signal and Grade Crossing Warning Systems (CFRC Signal Maintenance of Way Contractor to locate CFRC signal utilities)
- CFRC Communications (CFRC Operations and Maintenance Contractor to locate communication, fiber, and station electrical utilities)
- Level 3
- Verizon
- Duke Energy, Inc.

It is the responsibility of the Contractor to verify all utility locations, along with any other Utility Compensable Property Interests, and should relocation be required, include these costs in its Lump Sum price.

F) Railroad Coordination

The Contractor shall coordinate all work with the Engineer and the Department's CFRC operations and maintenance contractor (Bombardier Mass Transit Corporation) and the Department's CFRC signal maintenance of way contractor (Herzog Technologies, Inc.). Signal support shall be provided by Herzog Technologies, Inc. Roadway Worker Protection (RWP) training and track protection/employee in charge (EIC) personnel shall be provided by Bombardier Mass Transit Corporation. Contact information for operations and maintenance and signal maintenance of way contractors are shown below. Based on the hourly rates shown on the price proposal form, the Contractor shall estimate the operations and maintenance contractor and signal maintenance of way contractor man-hours needed to support the work and include these costs in their Lump Sum price.

Bombardier Mass Transit Corporation
Mike Dier, Chief Engineer
(407) 732-6726
Michael.Dier@us.transport.bombardier.com
Track Protection EIC

Herzog Technologies, Inc.
Nathan Morrison
(407) 562-2703
nmorrison@herzog.com
Signal Maintenance of Way Manager
Signal Support

Track work windows shall be in accordance with the Central Florida Operating and Management Agreement (CFOMA). All track shall be returned to service with the appropriate slow order prior to 11 p.m. on week days (Monday through Friday) to accommodate train service. Except as noted otherwise herein, the Contractor shall not perform track work between midnight and 5 a.m.

In double track territory, one track shall remain open to train traffic between control points at all times to allow train traffic to pass. The Contractor shall provide the Engineer with work plans for each portion of the work, including detailed schedules outlining what work will be accomplished in each work period.

Work plans shall be provided to the Engineer a minimum of 45 days prior to starting each portion of work. The Engineer shall be responsible for coordinating the work schedules with CSX Transportation Inc. (CSXT), National Railroad Passenger Corporation (Amtrak), and Florida Central Railroad.

In single track territory, the Engineer will coordinate track outages with tenant railroads to accommodate this Technical Requirements. The Contractor shall provide the Engineer with a single work plan, including schedules, covering all required work within single track territory a minimum of 60 days prior to starting all work within that territory.

The Contractor shall have replacement rail in service to accommodate the scheduled Amtrak service during all construction phases. Rail replacement in single track territory shall be restricted to night windows defined as 10:00 p.m. Friday night to 9:00 a.m. on Saturday morning and 8:00 p.m. Saturday night to 9 a.m. Sunday morning. All rail replacement work in single track territory shall be completed in a maximum of six (6) night windows. Tie replacement in single track territory shall be restricted to night windows defined as 10 p.m. Friday night to 9:00 a.m. on Saturday morning and 8:00 p.m. Saturday night to 9 a.m. Sunday morning. All tie replacement in single track territory shall be completed in a maximum of five (5) night windows.

The Contractor shall provide a six week look-ahead schedule for both single and double track territory, updated weekly, to the Engineer.

G) Critical Technical Requirements

The following outlines the critical technical requirements to complete the Technical Requirements for the track, ties and pedestrian crossing elements of the project. The Contractor is required to complete the Technical Requirements in accordance with the MWIs attached in Appendix D and the following critical technical requirements.

- Rail will be laid and anchored at a minimum rail laying temperature of 105°F
- All rail joints shall be welded
- Lay rail to 56-1/2” gage
- Following new tie insertion or ballast installation, tamp every tie over entire length of new ties installed
- Surface and line all track where new ties are installed. Maintain existing profile and alignment unless otherwise directed by the Engineer
- Following tie or ballast installation, stabilize the track with a dynamic track stabilizer before returning the track for to dispatch for train service
- Submit manufacturer model and specifications for the tamper and dynamic track stabilizer to the Engineer for approval prior to mobilization to the work site
- Final track profile and alignment at station platforms shall comply with the vertical and horizontal platform clearances shown in Table 1. The provided clearances in Table 1 are the maximum and minimum clearances for the final track profile and alignment – no additional tolerances are allowed.

Table 1: Track Clearances through Station Platforms

Track Clearances Through Platforms					
Platform	**Location**	**West Platform**		**East Platform**	
		Horizontal Clearance from gage side of field rail to face of platform (in)	Vertical Clearance from top of rail to top of platform (in)	Horizontal Clearance from gage side of field rail to face of platform (in)	Vertical Clearance from top of rail to top of platform (in)
DeBary	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Sanford	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Lake Mary	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Longwood	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	N/A	21.5 to 22.0		
Altamonte Springs	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Maitland	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Winter Park	Standard Platform	35.75 to 36.25	7.5 to 8.0	32.75 to 33.25	7.5 to 8.0
	Mini-High[(1)(2)]	N/A	21.5 to 22.0	N/A	21.5 to 22.0
Florida Hospital	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Lynx	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0		
Church St	Standard Platform	37.75 to 38.25	7.5 to 8.0	32.75 to 33.25	7.5 to 8.0
	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0	32.75 to 33.25	21.5 to 22.0
Orlando Amtrak	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform	
	Mini-High[(1)(2)]	N/A	21.5 to 22.0		

Track Clearances Through Platforms				
Platform	**Location**	**West Platform**		**East Platform**
Sand Lake Road	Standard Platform	32.75 to 33.25	7.5 to 8.0	Same as west platform
Sand Lake Road	Mini-High[(1)(2)]	37.75 to 38.25	21.5 to 22.0	Same as west platform

(1) Mini-High horizontal measurement is to the face of the mini-high step

(2) Mini-high vertical measurement is to the top passenger boarding surface

1.2 Highway Grade Crossing Upgrade

Table 2 lists the 34 locations for highway grade crossing upgrades. Since there are two (2) track crossings at some locations, there are a total of 54 highway grade crossing upgrades. Track crossing removal and replacement with asphalt concrete roadway pavement is required at two (2) locations. Crossing upgrades shall consist of new concrete panels, new rail, new ties, new ballast and subballast, new OTM, new asphalt roadway pavement, milling and resurfacing, lining and surfacing, track stabilization, field welds, and all other materials needed to complete the work consistent with this Technical Requirements. The Contractor shall supply and use a dynamic track stabilizer to minimize slow orders. Slow Orders shall comply with CFRC MWI 1109 – Temporary Speed Restrictions.

Crossing upgrades shall be performed in priority order based on the priorities listed in Table 2. All Priority 1 crossings shall be completed prior to beginning work on Priority 2 crossings. All Priority 2 crossings shall be completed prior to beginning work on Priority 3 crossings.

Table 2: Highway Grade Crossing Upgrades

Highway Grade Crossing Upgrades						
MP	**Crossing**	**Work**	**Priority**	**Total Road Crossing Panel Length (ft)[1]**	**Maximum Road Closure Window**	**Notes**
767.03	W. 18th St.	Upgrade Track 2	3	36	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
767.07	Southwest Rd.	Upgrade Track 2	2	54	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
767.51	Country Club Rd.	Upgrade Track 2	3	45	9 p.m. Friday to 9p.m. Saturday OR 9p.m. Saturday to 9p.m. Sunday	

Highway Grade Crossing Upgrades						
MP	**Crossing**	**Work**	**Priority**	**Total Road Crossing Panel Length (ft)[1]**	**Maximum Road Closure Window**	**Notes**
773.58	S. Country Club Rd.	Upgrade Track 2	1	81	9 p.m. Friday to 9p.m. Saturday OR 9p.m. Saturday to 9p.m. Sunday	
777.52	E. Palmetto Ave.	Upgrade Track 1	1	36	9 p.m. Friday to 9p.m. Saturday OR 9p.m. Saturday to 9p.m. Sunday	
777.81	CR 427	Upgrade Tracks 1 & 2	1	432	9 p.m. Friday to 3 a.m. Monday	
780.36	Leonard St.	Upgrade Track 2	1	36	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
780.55	SR 436/ Altamonte Dr.[2]	Upgrade Track 2	1	135	9 p.m. Friday to 3 a.m. Monday	
781.24	Ballard St.	Upgrade Track 1	1	45	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
783.09	George Ave.	Upgrade SGL Main	3	36	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
783.66	Palmetto Ave (Private bike crossing)	Upgrade SGL Main	3	27	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
784.73	North Denning Dr.	Upgrade Tracks 1 & 2	1	108	9 p.m. Friday to 3 a.m. Monday	
785.08	Pennsylvania Ave.	Upgrade Tracks 1 & 2	1	306	9 p.m. Friday to 3 a.m. Monday	Roads intersect at crossing. Considered one location
785.17	Webster Ave.					
786.19	S. Pennsylvania Ave.	Upgrade Tracks 1 & 2	1	198	9 p.m. Friday to 3 a.m. Monday	Roads intersect at crossing. Considered one location
786.19	Holt Ave					
786.56	S. Denning	Upgrade	2	126	9 p.m. Friday to 3	

Highway Grade Crossing Upgrades						
MP	**Crossing**	**Work**	**Priority**	**Total Road Crossing Panel Length (ft)[1]**	**Maximum Road Closure Window**	**Notes**
	Rd.	Tracks 1 & 2			a.m. Monday	
787.45	Wilkinson St	Upgrade Tracks 1 & 2	3	162	9 p.m. Friday to 3 a.m. Monday	
787.62	King St.	Upgrade Tracks 1 & 2	1	144	9 p.m. Friday to 3 a.m. Monday	
787.99	E. Princeton St.	Upgrade Tracks 1 & 2	1	216	9 p.m. Friday to 3 a.m. Monday	
788.43	W. Virginia Dr.	Upgrade Tracks 1 & 2	1	126	9 p.m. Friday to 3 a.m. Monday	
788.74	N. Highland Ave	Upgrade Tracks 1 & 2	2	108	9 p.m. Friday to 3 a.m. Monday	
789.48	W. Colonial Dr.	Upgrade Tracks 1 & 2	1	180	9 p.m. Friday to 3 a.m. Monday	
789.62	W. Concord St.	Upgrade Tracks 1 & 2	3	126	9 p.m. Friday to 3 a.m. Monday	
789.73	W. Amelia St.	Upgrade Tracks 1 & 2	1	126	9 p.m. Friday to 3 a.m. Monday	
790.23	W. Central Blvd	Upgrade Tracks 1 & 2	1	198	9 p.m. Friday to 3 a.m. Monday	
790.29	Pine St	Upgrade Tracks 1 & 2	2	144	9 p.m. Friday to 3 a.m. Monday	
790.82	America St	Upgrade Tracks 1 & 2	3	72	9 p.m. Friday to 3 a.m. Monday	
790.93	Ernestine St	Upgrade Tracks 1 & 2. Remove Track 3	3	72	9 p.m. Friday to 3 a.m. Monday	Crossing Removal
791.02	Gore St	Upgrade Tracks 1 & 2. Remove Track 3	1	144	9 p.m. Friday to 3 a.m. Monday	Crossing Removal
791.24	W. Columbia St	Upgrade Track 2	2	54	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
792.54	W Pineloch St	Upgrade Tracks 1 & 3	2	72	9 p.m. Friday to 3 a.m. Monday	
792.98	Drennen Rd	Upgrade Tracks 1 & 3	2	72	9 p.m. Friday to 3 a.m. Monday	
793.57	Holden Ave	Upgrade Track 1	3	45	9 p.m. Friday to 9 p.m. Saturday OR 9	

Highway Grade Crossing Upgrades						
MP	**Crossing**	**Work**	**Priority**	**Total Road Crossing Panel Length (ft)[1]**	**Maximum Road Closure Window**	**Notes**
					p.m. Saturday to 9 p.m. Sunday	
794.31	Stratemeyer St	Upgrade Track 2	3	54	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	
795.87	Glen Rose Ave	Upgrade Track 1	3	27	9 p.m. Friday to 9 p.m. Saturday OR 9 p.m. Saturday to 9 p.m. Sunday	

[1] – Length of total road crossing panels is the minimum total length required for all track crossings (i.e., for a 2 track crossing with the length of 100 feet, each track shall have a minimum panel length of 50 feet for each track)

[2] – The SR 436 highway grade crossing shall be the third highway grade crossing to be completed. Two different Priority 1 highway grade crossings shall be completed prior to initiating work at the SR 436 highway grade crossing.

A) Material

The Department will furnish a portion of the rail and ties for the project. See Section 3, Materials for a breakdown of materials to be furnished by the Department. The remaining required materials are to be furnished by the Contractor. All ties and rail within the crossing will be replaced. Ties and rail will be stockpiled at the locations shown below:

Rail:

- MP 762.4 - North of Barwick Road, East of Track 2
- MP 766.6 – South of McCracken Road, West of Track 1
- MP 788.5 – South of Virginia Avenue – East of Track 2
- MP 790.6 – South of South Street – East of Track 2

Ties:

- MP 778.9, East of Track 2 - North St laydown yard
- MP 789.3, West of Track 1 – Colonial Drive laydown yard

The Contractor will distribute the materials as necessary to complete these Technical Requirements. The rail sticks shall be flash butt welded to lengths needed for the crossing track panels and field welded using thermite welds. No joints or thermite welds are permitted within the limits of the track panel for each grade crossing. The Contractor shall supply all other materials (concrete panels, OTM, welds, etc.)

necessary to complete the Technical Requirements consistent with the CFRC MWIs attached in Appendix D, this project's FDOT Specifications, and the other Contract Documents.

B) Temporary Traffic Control Plan

The Contractor shall design a safe and effective Temporary Traffic Control Plan to maintain both rail and highway vehicular traffic during all phases of construction for each highway grade crossing. The temporary traffic control plan shall address how to maintain traffic throughout the duration of the work at each highway grade crossing. The Temporary Traffic Control Plan shall be prepared by a Professional Engineer registered in the State of Florida who is certified in the Advanced Training category by a Department approved training provider.

The Temporary Traffic Control Plans shall comply with the Department's Design Standards and the Roadway Plans Preparation Manual. The Contractor shall use Index Series 600 of the Department's Design Standards, latest edition, where applicable for highway elements. Should these standards not address each work area, a detailed Temporary Traffic Control Plan shall be developed. The Contractor shall prepare the Temporary Traffic Control Plans to include plan sheets, notes, and details. The details shall address the following: typical section sheet(s), general notes and construction sequence sheet(s), typical detail sheet(s), traffic control plan sheet(s), advanced signing sheet(s), and detour sheet(s). The Contractor shall prepare additional plan sheets such as cross sections, profiles, drainage structures, retaining wall details, and sheet piling as necessary for proper construction and implementation of the Temporary Traffic Control Plan.

The Contractor shall submit the Temporary Traffic Control Plans for approval for each highway grade crossing no later than 28 days prior to the road closure occurring at that crossing. The Department and the local jurisdiction shall have 14 days to review and accept the Temporary Traffic Control Plan for each crossing. No road closure will be authorized until the Department and the local agency with jurisdiction over the road have approved the Temporary Traffic Control Plans.

The road closure schedule will be subject to Department and local jurisdiction approval and will not be allowed to interfere with special events (parades, foot races, community events, etc.). Allowable hours for road closures by crossing are listed in Table 2. Road closures will generally be permitted to occur within two windows dependent on the crossing:

- 24 hour period from 9:00 p.m. Friday to 9:00 p.m. Saturday OR from 9:00 p.m. Saturday to 9:00 p.m. Sunday; OR
- 54 hour period from 9:00 p.m. on Friday to 3:00 a.m. on Monday

The following restrictions are placed on simultaneous road closures:

- 18th St. and Southwest Rd. – Cannot be closed at the same time
- SR 436 and Ballard St. – Cannot be closed at the same time
- N. Denning Dr. and Pennsylvania Ave./Webster Ave. – Cannot be closed at the same time
- King St. and Princeton St. – Cannot be closed at the same time

- Princeton St. and Virginia St. – Cannot be closed at the same time
- Colonial Dr. and W. Amelia St. – Cannot be closed at the same time
- America St and Ernestine St. – Cannot be closed at the same time
- Gore St. and W Columbia St. – Cannot be closed at the same time
- Pineloch Ave and Drennen Rd. – Cannot be closed at the same time
- Drennen Rd. and Holden Ave. – Cannot be closed at the same time

See Table 2 Highway Grade Crossing Upgrades for specific closure restrictions at each crossing.

C) Utility Coordination

The Contractor shall be responsible for maintaining all existing utilities within all work zones. The appropriate utility coordination is the responsibility of the Contractor. The Contractor shall coordinate all rail and tie installation with the Engineer who will be responsible for coordinating with CFRC Signal Maintenance of Way Contractor, Herzog Technologies, Inc., for the necessary signal support to identify, locate, protect, and restore all signal cabling, insulated joints, jumpers, and other items.

The Contractor shall follow Department standards, policies, and procedures for utility coordination. The Department standards, policies, procedures, and design criteria are contained in, this project's FDOT Specifications, Rule 14-46.001 (Utility Accommodation Manual), Utility User's Guide, and the Contract terms and conditions. Preliminary review of Utility Compensable Property Interest has indicated that the following Utility Owners may be eligible for reimbursement, should relocation be required.

- CFRC wayside and grade crossing warning systems (CFRC Signal Maintenance of Way Contractor to locate CFRC signal utilities)
- CFRC communications (CFRC Operations and Maintenance Contractor to locate communication, fiber, and station electrical utilities)
- Level 3
- Verizon
- Duke Energy, Inc.

It is the responsibility of the Contractor to verify all utility locations, along with any other Utility Compensable Property Interests, and should relocation be required, include these costs in its Lump Sum price.

D) Railroad Coordination

The Contractor shall coordinate all work with the Engineer and the Department's CFRC operations and maintenance contractor (Bombardier Mass Transit Corporation) and CFRC signal maintenance of way contractor (Herzog Technologies, Inc.). Signal support shall be provided by Herzog Technologies, Inc. RWP training and track protection/employee in charge (EIC) personnel shall be provided by Bombardier Mass Transit Corporation. Contact information for operations and maintenance and signal maintenance of way contractors are shown below. Based on the hourly rates shown on the price proposal form, the contractor shall estimate the operations and maintenance contractor and signal maintenance of way

contractor man-hours needed to complete this Technical Requirements and include this cost in their Lump Sum price.

Bombardier Mass Transit Corporation, Inc.
Mike Dier, Chief Engineer
(407) 732-6726
Michael.Dier@us.transport.bombardier.com
Track Protection EIC

Herzog Technologies, Inc.
Nathan Morrison
(407) 562-2703
nmorrison@herzog.com
Signal Maintenance of Way Manager
Signal Support

Track work windows shall be in accordance with the Central Florida Operating and Management Agreement (CFOMA). All track shall be returned to service with the appropriate slow order prior to 11 p.m. on week days (Monday through Friday) to accommodate train service. Except as noted otherwise herein, the Contractor shall not perform track work between midnight and 5 a.m.

The Contractor is limited to performing grade crossing work that requires fouling mainline track from Friday night at 10 p.m. to Monday morning at 4 a.m. The Contractor shall have track panels in place to accommodate the scheduled Amtrak service during all construction phases

In double track territory, one track shall remain open to train traffic between control points at all times to allow train traffic to pass. The Contractor shall provide the Engineer with work plans for each grade crossing, including detailed schedules outlining what work will be accomplished in the work period. The work plans, including schedules, shall be provided a minimum of 45 days prior to starting each grade crossing. The Engineer shall be responsible for coordinating the work schedules with CSXT, Amtrak, and Florida Central Railroad.

In single track territory, the Engineer will coordinate track outages with tenant railroads to accommodate this Technical Requirements. The Contractor shall provide the Engineer with a single work plan including schedules covering all required work within single track territory a minimum of 60 days prior to starting work within single track territory.

The Contractor shall provide a six week look-ahead schedule for both single and double track territory, updated weekly, to the Engineer.

E) Critical Technical Requirements

The following outlines the critical technical requirements to complete the Technical Requirements for the highway grade crossing elements of the project. The Contractor is required to complete the

Technical Requirements in accordance with the MWIs attached as Appendix D and the following critical technical requirements.

- Type of Crossing Surface Material
  - All crossing surfaces shown in Table 2 shall be concrete panel crossings unless otherwise noted.
    - Concrete panels shall have a shunt resistant gap in the metal banding of each gage panel
    - Concrete panels shall be designed for use in signaled territory
    - Concrete panels shall provide sufficient length to replace any existing pedestrian pathways through the highway grade crossing.
    - Rubber inserts shall be high resistance type rubber
    - Panels shall have an option for lag bolt and lift ring hole inserts available for ADA applications. Inserts shall be used in all pedestrian walkway/sidewalk locations.
    - Flangeway rubber inserts shall limit the horizontal flangeway gap to less than or equal to 2.5 inches in pedestrian walkway/sidewalk locations.
    - Shall comply with CFRC MWI 2527 and CFRC Specification 901A
    - Submit shop drawings to the Engineer for approval prior to procurement
- Coordination
  - Provide notification to the Department and local government agency responsible for crossing no later than 28 days prior to road closure
  - Provide notification and duration, 21 days in advance of road closure (911, fire, police, ambulance, rescue, post office, school district, tv/radio)
  - Provide Traffic Control Plans meeting FDOT and local government requirements for each crossing a minimum of 28 days prior to road closure.
- Signal Support – to be provided by CFRC Signal Maintenance of Way Contractor.
  - Assist on jumpers for road closures
  - Removal and reinstallation of track connections
  - Any other signal support, as needed to complete crossing upgrade work
- Asphalt Paving
  - Cut asphalt a minimum of three feet from edge of rail
  - At crossings where more than one track is being upgraded, replace all intertrack asphalt
  - Paved road surface level with top of rail for minimum of 30 inches
  - Runoff minimum of 1 inch per 10 feet
  - Install asphalt in accordance with this project's FDOT Specifications. Asphalt shall be superpave (Type SP) traffic level C with a spread rate of 110 lbs/SY per inch. Thickness shall equal the height of rail. Asphalt shall be placed in a minimum of two lifts.
  - At Ernestine St. and Gore St. Track 3 removals, replace track crossing with asphalt concrete. Match adjacent pavement thickness
- Ballast
  - Mainline AREMA gradation 4A
  - 12 inches below bottom of tie
  - Compact/roll ballast prior to track panel installation
  - Subballast to be a minimum 6 inches of crusher run

- Roadbed shall be excavated and new ballast and subballast shall be installed to the full extents of the approach ties
- See CFRC MWI 301

- Rail
  - 115 lb. RE SS rail to be used on all crossings, with exception of the following crossings:
    - MP 767.03 18th St. – Use 132 lb. RE SS
    - MP 767.07 Southwest Rd. – Use 132 lb. RE SS
    - MP 767.51 Country Club Rd. – Use 132 lb. RE SS
  - Rail to extend a minimum of 20 feet beyond outside end of each crossing panel assembly
  - Transition rail shall be used when necessary
  - See CFRC MWI 507
- Welds
  - Field Welds shall be thermite welds. All other welds shall be flash butt
  - Thermite welds may not be located within the limits of new rail for each grade crossing
  - All joints within 50 feet of each side of the crossing must be welded within three days
  - Ultrasonically hand test all welds within 30 days, submit test results to the Engineer
  - See CFRC MWI 801
- Ties
  - New 10-foot timber ties shall be used for grade crossings and include 10 additional 10-foot ties on each approach to the grade crossing panels and under the grade crossing panels
  - The use of white oak ties are prohibited
  - All ties within the crossing panel limits shall be replaced
  - See CFRC MWIs 401, 403, and 2527
  - Dispose of used ties (except removed pedestrian crossing ties to be stockpiled) in accordance with all environmental laws and regulations. Submit tie disposal certificates to the Engineer.
- Gage
  - Standard gage is 56-1/2 inches
- Spiking
  - Within the track panel limits use one rail holding spike and one plate holding spike on gage and field sides
  - Tie plates shall all be new
  - Tie plates shall be double shoulder type
  - Spiking pattern on approach ties shall follow standard spiking patterns
  - See MWI 2512
- Anchors
  - New anchors shall be used on all road crossings
  - On crossings 50 feet in width or greater in CWR territory, each tie shall be box anchored on every tie for 130 ties in each direction (In jointed rail territory use standard anchor patterns)
  - See CFRC MWI 703
- Drainage

    - Install 6-inch minimum perforated pipe, 12 inches off the end of the tie on both sides of each replaced track. Daylight perforated pipe to adjacent trackside ditch.
    - Extend perforated pipe to a minimum of 10 feet off each end of the roadway panels.
    - Adequate drainage shall be provided at all four quadrants, sloped or diverted away from the crossing.
- Geotextile Fabric (Filter Fabric)
    - Geotextile fabric shall be used on all crossings
    - Geotextile fabric shall be nonwoven type, 16 to 20 ounces/square yard
    - Install 12 inches below bottom of tie
    - See CFRC MWI 1003
- Signal Conduit
    - Install two (2) four inch orange HDPE SDR-11 conduits with one No. 12 AWG pull wire in each conduit. Cap all pipe ends.
    - Place both conduits in same locations, at bottom of ballast layer, 12 inches off the end of the tie.
    - Extend conduits 10 feet past the end of the crossing panels on both sides of the crossing.
    - Document location on Highway Grade Crossing Installation Report (see attached).
- Cleanup
    - Dispose of all scrap material and remove old asphalt within 7 days after completion of each crossing upgrade.
    - The Contractor shall be responsible for the removal of rail and OTM in accordance with local, state, and federal environmental regulations.
- Documentation
    - Fill out and submit to the Engineer the Highway Grade Crossing Installation Report (see attached Appendix C)
    - Complete other reports as necessary (track disturbance, field welding report, etc.)

2. Schedule & Submittals

The Contractor shall prepare and submit a schedule for completion of the Technical Requirements from Notice-to-Proceed (NTP) through final acceptance by the Department. The schedule shall include all activities required to complete this Technical Requirements and shall show tasks and durations in sufficient detail to allow the Department to analyze the time required to complete. Prior to procurement of the concrete crossing panels, the Contractor shall submit shop drawings to the Engineer for review and approval. All work which requires road closures or will impact rail operations must be within the windows shown in Table 2. Further restrictions may be required based upon local special events (parades, etc.) and the need to accommodate tenant railroads.

Schedule to include as a minimum the following:

- Order Materials
- Deliver Materials
- Plan submittals – Work Plans and Temporary Traffic Control Plans

- Field activities – preparation, curfew requirements, speed restriction start/finish of field activities, execution of each major field activities, clean-up/closeout
- Estimated slow orders & removal plan
- Follow-up Field Testing of welds

The following schedule limitations shall apply to the schedule:

- Pedestrian tie replacement within the stations shall be completed within 84 days from issuance of NTP.
- Grade Crossing Upgrade Priority Group One crossing work shall be completed within 182 days from issuance of NTP
- Grade Crossing Upgrade Priority Group Two crossing work shall be completed within 224 days from issuance of NTP
- Grade Crossing Upgrade Priority Group Three crossing work shall be completed within 330 days from issuance of NTP
- Remainder of track renewal work (excluding rail, tie and pedestrian work within the stations) shall be completed within 330 days from issuance of NTP

3. Materials

The Department will furnish the following ties and rail to the contractor at stockpiled locations to complete the Technical Requirements:

- 61,061 LF 115RE Rail in 74 to 80 foot sticks
- 2,849 LF 132 RE Rail in 74 to 80 foot sticks
- 9,213 8.5 foot ties
- 1,727 10 foot ties

The Contractor shall furnish all other ties, rail, crossing panels and OTM necessary to complete the Technical Requirements.

4. Potential Additional Services

Potential Additional Services are described herein solely for informational purposes and are not to be included in the lump sum price for this project. These additional services are contemplated by the Department, and may or may not be provided, at the Department's sole discretion, by other contractors or this Contractor. If and when such services are sought additional information will be provided to the Contractor.

These potential additional services may include the installation of additional crossing surfaces associated with the implementation of Quiet Zones and other railroad improvements. These potential additional services could include: track panels with rail, ties and concrete crossing panels; concrete crossing panel extensions; and OTM

5. Technical Criteria

All material supply, testing, construction work and documentation shall be in accordance with the latest versions of the following documents at the time of advertisement:

1) CFRC MWI's attached in Appendix D
2) CFRC 49 CFR Part 213 Continuous Welded Rail Plan
3) FRA 49 CFR Part 213 Track Safety Standards
4) AREMA Manual of Practice, Volume 1
5) This Project's FDOT Specifications
6) FDOT Design Standards for Construction Operations on the State Highway System

All Roadway Worker Protection shall be in accordance with the latest version, at the time of advertisement, of the CFRC Roadway Worker Protection plan.

5.1 Additional Definitions

"Central Florida Operating and Management Agreement (CFOMA)" means the Central Florida Operating and Management Agreement between the State of Florida Department of Transportation and CSX Transportation, Inc. pertaining to the Central Florida Rail Corridor, a line of railroad between DeLand, Florida, MP A749.61 and Poinciana, Florida, MP A813.82 and related properties dated November 30, 2007, and amendments.

"VSMF" means Vehicle Storage and Maintenance Facility at Rand Yard in Sanford, Florida.

"Amtrak" means the National Railroad Passenger Corporation.

"CSXT" means CSX Transportation Inc.

5.2 Safety Certification Process

This work is to be certified through the Safety Certification Process in accordance with the SunRail Safety Certification Plan. The contractor shall prepare Safety and Security Construction Conformance Checklists for review and approval by the Engineer. The contractor shall coordinate construction activities, inspections, reports and all other appropriate documentation to ensure verification and conformance with the Safety and Security Construction Conformance Checklists. The Safety Certification process will follow the methodology found in the Federal Transit Authority's "Handbook for Transit Safety and Security Certification", November 2002.

5.3 CFRC Maintenance of Way Instructions/Standard Drawings for Track Renewal & Grade Crossing Upgrade Project

Maintenance of Way Instructions/Standard Drawings for Track Renewal & Grade Crossing Upgrade project to complete the Technical Requirements is included in Appendix D.

The following changes to Maintenance of Way Instructions/Standard Drawings for Track Renewal & Grade Crossing Upgrade Project included in Appendix D apply:

- The terms **CFRC Maintenance of Way Manager, CFRC Chief Operating Office, Chief Engineer, Roadmaster, Track Manager, Signal Maintenance Manager, Signal Manager, Bridge Manager**, are replaced with the term **Engineer**. The definition of the term **Engineer** is defined in the FDOT Standard Specifications for Road and Bridge Construction
- MWI 301-04 page 4 of 7 – Item (6) paragraph (B): The 4th sentence is deleted and replaced with the following:
    - The reports shall be forwarded in a consolidated monthly summary of tests in an electronic tabulated format.
- MWI 99001 page 1 of 20 – Item 1.0 Scope: The 2nd sentence is deleted.
- MWI 507-04 page 2 of 6 – Section I Item G.: Item G is deleted and replaced with the following:
    - G. All flash butt welds will be magnetic particle tested in accordance with AREMA manual for Railway Engineering Volume 1, Chapter 4 Rail, Part 3 Joining of Rail
- MWI 507-04 page 3 of 6 - Section II Item B: The 1st sentence is deleted. The column containing Stock Control # is deleted in its entirety.
- MWI 708-01 page 1 of 3 – Section II Subsection A Item 1: Item 1 is deleted and replaced with the following:
    - 1. Premium insulated joints are joints design to exhibit more elasticity or stiffness than standard insulated joints
- MWI 801-06 various locations – the terms listed in the left side column of the following table are deleted in every instance they appear in MWI 801-06. Replacement terms are provided in the right side column if applicable:

Deleted Term	Replacement
SNOOP	Liquid Leak Detector
Orgo Thermit	N/A
Boutet	N/A
Railtech	N/A
CJ Crucible	sealed, felt lined, lid type crucible
CJ Crucible (one-shot)	Sealed, felt lined, lid type crucible
Victor HD310C Torch Handle	Torch Handle with built in reverse flow check valves
Teflon	Polytetrafluoroethylene (PTFE)
Maximo	N/A
Tempilstick	Temperature indicating stick
CJ Fork	Fork
CJ Crucible Fork	Crucible Fork
Plasser	N/A

- MWI 801-06 Page A-8 – Item 10. Item 10 is deleted and replaced with the following:

- 10. All ground connection must be mechanically strong, close to the work, and of adequate size electrically. Never attach ground clamp to the rail base. Use of a magnetic ground clamp that attaches to the ball of the rail is recommended.

- MWI 801-06 Page C-1 – Item 1. Item 1 is deleted and replaced with the following:
  - Engine burns in carbon steel rails will be repaired through the use of the electric-arc welding process with the mandatory use of either heating blocks or a rail heater
- MWI 801-06 Page G-7 – Sketch G-4A. The following sentence is deleted:
  - Ordering Reference Class 015 Item 0001750
- MWI 801-06 Page I-6 – Item 25. Item 25 is deleted.
- MWI 801-06 Page I-7 - Heading for Hydraulic Rail Puller Procedures for Geismar Model TH-120-STP is deleted and replaced with the following:
  - Hydraulic Rail Puller Procedures for 120 Ton Rail Puller
- MWI 801-06 Page I-10 - Heading for Hydraulic Rail Puller Procedures for Simplex RP 120 is deleted and replaced with the following:
  - Hydraulic Rail Puller Procedures for 120 Ton Rail Puller
- MWI 801-06 Page I-14 – Item j. The third sentence in Item j. is deleted and replaced with the following:
  - Use of a "Canting Tool" is very helpful in removing twist from the rail
- MWI 801-06 Page I-16 – Item g. Item g. is deleted and replaced with the following:
  - g. Ready-to-use luting material is available.
- MWI 801-06 Page I-17 – Item d. Item d. is deleted and replaced with the following:
  - d. Follow all manufacturer's approved preheating instructions
- MWI 801-06 Page I-24 – Item e. Item e. is deleted and replaced with the following:
  - e. The proper preheat working pressures are: Propane – 15 PSI; Oxygen – 65 PSI; Burner Hgt – 1 1/2"
- MWI 801-06 Page I-27 Item d. Sub-item 2. Sub-item 2 is deleted and replaced with the following:
  - 2. Use a mechanical or hydraulic jack under the center of the two rail ends, and lift them slightly. Place the four wedges under each side of the tie plate on both ties to nearly the desired height. Then remove the jack. A few light hits with a dead blow hammer should be all that is required to reach the desired crown and elevation.
- MWI 801-06 Page I-32 Item e. Item e. is deleted and replaced with the following:
  - e. Use the manufacturer approved preheating equipment
- MWI 801-06 Page I-35 Item 9. Item 9 is deleted and replaced with the following:
  - 9. REPORTING
    - A welding report must be submitted at the completion of each work day, as well as a Track Disturbance Record for any Thermite weld made in the track structure. Be sure to use "WG" as the weld type instead of "BU" so the proper credit will be recorded when making Wide Gap Welds. Also record the thermite weld batch/serial numbers.
- MWI 801-06 Page M-1 Item e. Item e. is deleted and replaced with the following:

- e. Electric flash butt welds shall be marked on the field side web of the rail near the weld with an identifying marking. This marking will include the following information:
  - The vender or CFRC equipment making the weld; use vender or CFRC abbreviations
  - The equipment number of the machine/truck making the weld
  - Was this a closure weld?
    - If it was insert a "C" before the sequence number
    - If not, leave blank
  - The weld sequence number
  - The date the weld was made
- A sample marking for a closure weld made by XYZ corporation, using truck # 555 follows: XYZ 555 C 1234 1/18/06

- MWI 801-06 Page M-4 the 6th paragraph under the heading REPAIR WELDING PROCEDURE. The 6th paragraph is deleted and replaced with the following:
  - Temperature Measuring Device – The In-Track Welding Team is normally equipped with a digital thermometer with an industrial surface probe both having temperature ranges of at least -127°C to 600°C. It should read instantly and temperature measurements can be made quickly
- MWI 801-06 Pages N-1 thought N-3. Section N is deleted and replaced with the following:

- **N. APPROVED WELDING ELECTRODES AND WIRES**

FOR USED WITH MANAGANESE FROGS

Size	***Polarity***	***Description***	***Use***
3/16" Electrode	*DCRP*	Coated 22% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
1/16" Wire	*DCRP*	Flux core, self-shielded 25% manganese alloy.	Build-up and repair of manganese components In frogs and crossings.
5/64" Wire	*DCRP*	Flux core, self-shielded 25% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
5/32" 3/16" Electrode 5/64" 1/16" Wire	DCRP	Coated CR NI MG alloy. Deposit hardness 200 BHN. Work hardens to 470 BHN.	Build-up and repair of manganese components in frogs and crossings. Peened as deposited except first and last pass.

Size	*Polarity*	*Description*	*Use*
5/32” 3/16” 3/16” Electrode	DCRP DCRP DCRP	Coated High Strength joining electrode. As deposited 160 BHN. Work hardens to 450 BHN.	Repairing flangeway cracks and defects in manganese frogs and crossings, and starter pads for manganese build-up. Keep 3/8" below running surface.
1/16” 5/64” Wire	DCRP	Flux core, self shielded Austenitic Manganese 11% to 14% - As deposited 220 BHN. Work Hardens to 530 BHN.	Build-up and repair of manganese components in frogs and crossings. Peened as deposited except first and last pass.

FOR USE WITH RAILS

Size	*Polarity*	*Description*	*Use*
3/16” Electrode	*DCRP*	Coated Carbon Steel Alloy. Deposit hardness 208 BHN Work hardens to 390 BHN	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings Use approximately 180 amps..
1/16” 5/64”Wire 1/16”Wire 5/64” Wire	DCRP	Coated Carbon Steel Alloy. Deposit hardness 208 BHN Work hardens to 390 BHN	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings Use approximately 28 Vo
1/8” 3/16” Electrode	DCRP	Coated Carbon Steel Alloy. Deposit hardness 208 BHN Work hardens to 390 BHN	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings Use approximately 180 Amps

Size	*Polarity*	*Description*	*Use*
1/8” 5/32” 3/16” Rod	DCRP	Hardalloy	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings
1/16” 5/64” Wire	DCRP	Carbon Steel Alloy	Build-up and repair of carbon steel components; rail ends, switch points engine burns, and rail, bolted frogs and crossings Use approximately 28 Vo
1/8” 5/32” 3/16” 1/4" Rod	DCRP		Use ¼” only with machines capable of 300+ amps

OTHER RODS

Size	*Polarity*	*Description*	*Use*
1/4” x 22” 1/4” x 44”	*DCRP*	Tubular metal rod	For removal of defective material from manganese components
5/32" x 12" 3/16" x 12" 1/4" x 12" 5/16" x 12" 3/8" x 12" 3/8” x 5/32” X12” 5/8" x 3/16" x 12" 3/8” x 12”	*DCRP*	Copper coated carbon arc	For removal of defective material by gouging.
1/8” 5/32" 3/16" 3/32” 1/4”x18” Electrode	*DCRP*	Electrode made to AWS E7018E specifications.	Welding structural steel, repairing roadway machines, frames, etc.

MWI 801-06 Pages O-1 thought O-10. Section O is deleted.

- MWI 901-07 various locations – the terms listed in the left side column of the following table are deleted in every instance they appear in MWI 901-07. Replacement terms are provided in the right side column if applicable:

Deleted Term	**Replacement**
Torx	Star
(015.0001283.1)	N/A
Pandrol	Positive Restraint Tie

- MWI 1101-05 Page 5 of 8 Item 1. d) – Item 1. d) is deleted and replaced with the following:
  - d) Rail anchors, spikes, screws or positive restraint rail fasteners will be handled bulk through team supply chains
- MWI 1101-05 Page 8 of 8 Item A. Item A. is deleted and replaced with the following:
  - A. The Engineer will ensure that the Daily Production Reports are input into the appropriate computer system, completed with a hand held device, faxed in using the

proper form, or telephoned into the office. These reports must be completed for each day's production. Care must be exercised to ensure that all information is accurate.

- MWI 1103-04 Page 10 of 10 Curve Alignment Reference Form, Type of Fasteners, Pandrol Plates; The term Pandrol Plates is deleted and replaced with the following:
    - (Positive Restraint Tie Plates)
- MWI 1109-11 Page 7 of 18 Item 3. Item 3 is deleted and replaced with the following:
    - 3. When any of the activities or conditions identified in section II.G.1. & II.G.2. are performed, regardless of rail temperature, a *Track Disturbance Report* must be completed. The *Track Disturbance* Report should be reviewed periodically to ensure that temporary speed restrictions are placed when temperature conditions warrant.
- MWI 1125-03 Page 8 of 11 Item 4. – Item 4. Is deleted
- MWI 1125-03 Page 11 of 11 Item A. – Item A is deleted and replaced with the following:
    - The employee–in-charge of the rail laying will complete the records of rail laying on a continuous basis during rail installation. All records shall be provided to the Engineer.
- MWI Volume II Standard Drawings – Epoxy Bonded Insulated Joint for 115RE, 132RE, 136RE, and 141RE Rail. The following items are deleted from the subject standard drawing
    - 013.30000300.1 LB FOSTER BONDED INSULATED JOINT BOLT REPLACEMENT KIT
    - 013.30000400.1 PORTEC/KOPPERS BONDED INSULATED JOINT BOLT REPLACEMENT KIT
- MWI Volume II Standard Drawings – Main Track Spiking Patterns Side Track Spiking Patterns. the terms listed in the left side column of the following table are deleted in every instance they appear in subject standard drawing. Replacement terms are provided in the right side column if applicable:

Deleted Term	Replacement
PANDROL ROLLED PLATE	POSITIVE RESTRAINT ROLLED PLATE
PANDROL VICTOR PLATE	AREMA TYPE POSITIVE RESTRAINT PLATE

APPENDIX A - CWR INSTALLATION							
LOCATIONS	**Track 1 East Rail**	**Track 1 West Rail**	**Track 2 East Rail**	**Track 2 West Rail**	**Total Lineal Feet**	**Insul-ated Joints**	**REMARKS**
DeBary Station	512	512	0	0	**1024**	**2**	Replace from north of existing insulated joints to 100 feet south of station platform. Install 2 new insulated joints at existing locations. All rail/IJ's to be 132RE.
Lake Mary Station	315	297	0	0	**612**		Replace from Palmetto Ave. grade crossing tangent to spiral (TS) point
Longwood Station	250	260	0	0	**510**		Replace as marked within station
Maitland Station	206	216	0	0	**422**		Replace from spiral to tangent (ST) point to 100 feet south of the mini-hi
CP 783 to Sybelia Ave	283	283	N/A	N/A	**566**		Replace from switch to Sybelia Ave grade crossing
Sybelia Ave to George Ave	495	495	N/A	N/A	**990**		Replace from Sybelia Ave to 2003 rail
Horatio Ave to Packwood Ave	271	267	N/A	N/A	**538**		Replace from Horatio Ave to 2003 rail
Ventris Ave to Palmetto Ave	500	485	N/A	N/A	**985**		Replace from Ventris Ave to 2003 curve rail
Palmetto Ave to Lake Ave	555	212	N/A	N/A	**767**		Replace from south end of curve to Lake Ave grade crossing
Lake Ave to 17/92 UGB	507	0	N/A	N/A	**507**		Replace from Lake Ave grade crossing to tangent to spiral (TS) point of curve
Lake Ave to 17/92 UGB (CURVE)	0	**1283**	N/A	N/A	**1283**		Replace west rail for entire curve with **1283 feet of 115RE head hardened rail**
Lake Ave to 17/92 UGB (BRIDGE)	**400**	**400**	N/A	N/A	**800**		Replace from just north of US 17/92 bridge to just south of US 17/92 bridge. Replace with **400 feet of 115RE head hardened rail for each rail.**
US 17/92 bridge to CP 784	741	726	N/A	N/A	**1467**		Replace from US 17/92 bridge to beginning of curve
CP 784 to N. Denning Dr (CURVE)	**214**	**222**	0	0	**436**	**3**	Replace east and west rail from turnout to N. Denning Dr grade crossing. On west rail, replace insulated joint at turnout and at signal. On east rail, replace insulated joint at signal.
Signal 785.4 to new CWR 130 feet to the north of Signal 785.4	130	34	0	0	**164**		Replace between the signal and the new CWR located approximately 130 feet north of the signal
New York Ave to Signal 785.4	32	0	0	28	**60**		Replace from insulated joints at MP 785.4 signal to New York Ave grade crossing
New York Ave to Canton Ave	0	0	0	**82**	**82**		Replace between the grade crossings with **115RE head hardened rail.**
Canton Ave to Morse Blvd	142	165	167	211	**685**		Replace jointed rail from the Winter Park station pedestrian crossing north of Morse Blvd to Morse Blvd grade crossing
Canton Ave to Morse Blvd (CURVE)				**710**	**710**		Replace Track 2 west rail from Canton Ave grade crossing to the end of the curve with **710 feet of 115RE head hardened rail**

APPENDIX A - CWR INSTALLATION							
LOCATIONS	**Track 1 East Rail**	**Track 1 West Rail**	**Track 2 East Rail**	**Track 2 West Rail**	**Total Lineal Feet**	**Insul-ated Joints**	**REMARKS**
Morse Blvd to New England Ave	155	573	0	**571**	**1299**		Replace Track 1 east rail from Morse Blvd grade crossing to beginning of curve. Track 1 west rail from grade crossing to grade crossing. Track 2 west rail, **replace with 571 feet 115RE head hardened rail** from grade crossing to grade crossing
New England Ave to New York Ave/Lyman Ave	0	260	0	**271**	**531**		Replace Track 1 west rail from New England Ave grade crossing to insulated joint at the signal north of New York Ave/Lyman Ave grade crossing. Track 2 west rail, **replace with 271 feet 115RE head hardened rail** from New England Ave grade crossing to insulated joint at the signal north of New York Ave/Lyman Ave grade crossing.
New York Ave/Lyman Ave to Fairbanks	610	897	0	**300**	**1807**		Replace Track 1 west rail from New York Ave/Lyman Ave grade crossing to Fairbanks Ave grade crossing. Track 1 east rail from spiral to tangent (ST) point to Fairbanks Ave grade crossing. Track 2 west rail, **replace with 300 feet 115RE head hardened rail**, from New York Ave/Lyman Ave grade crossing to spiral to tangent (ST) point
Fairbanks Ave to Holt Ave/Pennsylvania Ave	466	442	0	0	**908**		Replace from grade crossing to grade crossing
Holt Ave/Pennsylvania Ave to Minnesota Ave	590	617	0	0	**1207**		Replace from spiral to tangent (TS) point of curve to Minnesota Ave grade crossing
Minnesota Ave to S. Denning Dr	638	638	0	0	**1276**		Replace from grade crossing to grade crossing
S. Denning to Orlando Ave	776	775	0	0	**1551**		Replace Track 1 replace east rail (452 feet) and west rail (475 feet) from S Denning Dr grade crossing to north end of curve. Track 1 replace east rail (324 feet) and west rail (300 feet) from south end of curve to Orlando Ave grade crossing.
Orlando Ave to Westchester Ave	789	770	0	0	**1559**		Replace from grade crossing to grade crossing
Westchester Ave to Wilkinson St	850	547	0	0	**1397**	**1**	Replace Track 1 replace east rail (484 feet) and west rail (547 feet) from Westchester Ave grade crossing to north end of curve. Track 1 south of curve to Wilkinson St grade crossing, replace east rail (366 feet) and insulated joint on east rail at signal.
King St to Rollins St	625	732	0	0	**1357**		Replace Track 1 replace east and west rails from King St grade crossing to north end of curve.

APPENDIX A - CWR INSTALLATION							
LOCATIONS	**Track 1 East Rail**	**Track 1 West Rail**	**Track 2 East Rail**	**Track 2 West Rail**	**Total Lineal Feet**	**Insul-ated Joints**	**REMARKS**
Florida Hospital Station (Rollins St to Princeton St)	436	560	0	0	**996**		Replace Track 1 replace east and west rails from south end of curve to Princeton St grade crossing
Princeton St to Virginia Ave	**1453**	730	0	0	**2183**		Replace Track 1 in the curve, **replace east rail with 713 feet of 115RE head hardened rail**. Track 1 from south end of curve to Virginia Ave grade crossing, replace east rail (740 feet) and west rail (730 feet).
Highland Ave to Magnolia Ave	178	497	0	0	**675**		Replace Track 1 west rail, replace rail from south end of curve to Magnolia Ave grade crossing. Track 1 east rail, replace jointed rail north of Magnolia Ave grade crossing.
Magnolia Ave to Orange Ave	276	180	0	0	**456**		Replace Track 1 replace east and west rails from Magnolia Ave grade crossing to north end of curve.
Marks St to Colonial Dr	110	0	0	0	**110**		Replace Track 1 east rail, replace jointed rail north of Colonial Dr grade crossing.
Colonial Dr to Concord St	654	636	0	0	**1290**		Replace from grade crossing to grade crossing
Concord St to Amelia St	463	462	0	0	**925**		Replace from grade crossing to grade crossing
LYNX Station (Amelia St to Livingston St)	560	560	0	0	**1120**		Replace from grade crossing to grade crossing
Livingston St to Robinson St	553	563	0	0	**1116**	**2**	Replace from grade crossing to grade crossing. Replace existing insulated joints at signal
Robinson St to Jefferson St.	281	278	0	0	**559**		Replace from grade crossing to grade crossing
Jefferson St to Washington St	144	68	0	0	**212**		Replace Track 1 north of switch, replace east rail (108 feet) and west rail (26 feet). Track 1 south of switch, replace east rail (36 feet) and west rail (42 feet)
Washington St to Central Ave	478	470	0	0	**948**		Replace from grade crossing to grade crossing
Central Ave to Pine St	180	180	0	0	**360**		Replace from grade crossing to grade crossing.
Pine St to Church St	268	268	0	0	**536**		Replace from grade crossing to grade crossing
Church St Station (Church St to South St)	555	525	0	0	**1080**		Replace from grade crossing to grade crossing
Church St Station (South St to Anderson St Bridge) (Curve)	0	0	0	**879**	**879**		Track 2, **replace west rail in curve with 879 feet of 115RE head hardened rail**
Under Anderson St overhead bridge (tangent between two curves	218	98	101	0	**417**	**0**	Replace tangent section between the two curves, approximately under the Anderson St bridge

APPENDIX A - CWR INSTALLATION							
LOCATIONS	**Track 1 East Rail**	**Track 1 West Rail**	**Track 2 East Rail**	**Track 2 West Rail**	**Total Lineal Feet**	**Insul-ated Joints**	**REMARKS**
Anderson St Bridge to America St (Curve)	0	0	**953**	**965**	**1918**	**0**	Track 2, **replace east rail (953 feet) and west rail (965 feet) within curve with 115RE head hardened rail.**
America St to Ernestine St	515	512	0	0	**1027**	**0**	Replace from grade crossing to grade crossing
Ernestine St. to Crossover south of Ernestine St	37	32	0	0	**69**	**0**	Replace Track 1 from Ernestine St grade crossing to the crossover south of Ernestine St.
Crossover north of Gore St to Gore St grade crossing	135	121	0	0	**256**	**0**	Replace from the crossover north of Gore St to the Gore St grade crossing
Gore St grade crossing to the north end of the crossover south of Gore St	187	190	0	0	**377**	**0**	Replace from Gore St grade crossing to the north end of the crossover south of Gore St
South end of crossover south of Gore St to the new CWR to the south	34	33	0	0	**67**	**0**	Replace from the south end of the crossover south of Gore St to the new CWR to the south of the crossover
Track 1 to 3 turnout to the new CWR to the north of the turnout	83	77	0	0	**160**	**0**	Replace from the track 1 to 3 turnout North of Columbia St to the new CWR to the north of the turnout
Track 1 to 3 turnout to Columbia St	250	258	**45**	**45**	**598**	**2**	Replace from the track 1 to 3 turnout to Columbia St. Cut out the 45 foot insulated joints on east and west rails from track 3 and replace with standard 115 RE rail. Replace the existing east and west rail poly bars on track 1 at the signal with the track 3 insulated joints.
Columbia St to turnout north of Kaley St	2482	2482	0	0	**4964**	**0**	Replace from grade crossing to grade crossing
Kaley St. to crossover south of Kaley St	94	93	0	0	**187**	**0**	Replace from Kaley St grade crossing to first crossover south of Kaley St
Sand Lake Station	540	540	0	0	**1080**	**2**	Replace from 100 feet north of the station to 100 feet south of the mini-high. Replace two IJ's at north end of the station.
NON-STATION TOTAL LF	**20393**	**20696**	**1266**	**4062**	**46417**	**8**	**Eliminates 1950's jointed rail**
STATIONS TOTAL LF	**1823**	**1825**	**0**	**0**	**3648**	**4**	**Replaces old CWR within stations**
Note: red numbers indicate head hardened rail shall be used **Note: All rail is 115 RE SS unless otherwise noted.**							
					Rail Miles:	**9.48**	
					Track Miles	**4.74**	

APPENDIX B - TIES TO BE REPLACED				
STATIONS & Other Locations	**Track 1**	**Track 2**	**Total**	**Remarks**
DeBary Station	66	0	**66**	
Sanford Station	41	130	**171**	
Old Sanford Station (North of McCracken Rd)	156	162	**318**	
Lake Mary Station	14	0	**14**	
Longwood Station	50	0	**50**	Ties located on the north end of the station
Altamonte Station	0	75	**75**	
Maitland Station	78	0	**78**	
CP 783 to Sybelia Ave	20	**N/A**	**20**	Ties located between switch and Sybelia Ave road crossing
Sybelia Ave to George Ave	60	**N/A**	**60**	Ties located between grade crossings
George Ave to Horatio Ave	70	**N/A**	**70**	Ties located between grade crossings
Horatio Ave to Packwood Ave	90	**N/A**	**90**	Ties located between grade crossings
Packwood Ave to Maitland Ave	20	**N/A**	**20**	Ties located between grade crossings
Maitland Ave to Ventris Ave	40	**N/A**	**40**	Ties located between grade crossings
Ventris Ave to Palmetto Ave	175	**N/A**	**175**	Ties located between grade crossings
Palmetto Ave to Lake Ave	230	**N/A**	**230**	Ties located between grade crossings
Lake Ave to US 17/92 bridge	510	**N/A**	**510**	Ties located between Lake Ave and US 17/92 bridge
US 17/92 bridge to CP 784	170	**N/A**	**170**	Ties located between US 17/92 bridge and switch
CP 784 to N. Denning Drive	50	30	**80**	Ties located between switch and N. Denning Drive grade crossing
Denning Dr to Penn/Webster Ave	273	247	**520**	Ties located between grade crossings
Penn/Webster Ave to New York Ave	298	226	**524**	Ties located between grade crossings
Winter Park Station	127	147	**274**	Ties located from north end of station to Morse Blvd grade crossing
Winter Park Station	32	0	**32**	Ties located from Morse Blvd grade crossing to New England Ave grade crossing
Winter Park Station	100	76	**176**	Ties located from New England Ave grade crossing to Lyman Ave grade crossing
Lyman Ave /New York Ave to Fairbanks Ave	152	0	**152**	Ties located between grade crossings
Fairbanks Ave to Holt/Penn Ave	72	73	**145**	Ties located between grade crossings
Holt/Penn Ave to Minnesota Ave	163	158	**321**	Ties located between grade crossings
Minnesota Ave to S Denning Dr	131	0	**131**	Ties located between grade crossings
Denning Dr to US 17/92	202	220	**422**	Ties located between grade crossings
US 17/92 to Westchester Ave	145	157	**302**	Ties located between grade crossings
Westchester Ave to Wilkinson St	309	0	**309**	Ties located between grade crossings
Wilkinson St to King St	174	0	**174**	Ties located between grade crossings
King St to Rollins St	143	0	**143**	Ties located between grade crossings

APPENDIX B - TIES TO BE REPLACED				
STATIONS & Other Locations	**Track 1**	**Track 2**	**Total**	**Remarks**
Florida Hospital Station	212	209	**421**	Ties located between Rollins St grade crossing and Princeton St grade crossing
Princeton Ave to Virginia Ave	362	0	**362**	Ties located between grade crossings
Virginia Ave to Alden Rd	107	0	**107**	Ties located between grade crossings
Alden Rd to Highland Ave	37	0	**37**	Ties located between grade crossings
Highland Ave to Magnolia Ave	233	0	**233**	Ties located between grade crossings
Magnolia Ave to Orange Ave	87	0	**87**	Ties located between grade crossings
Colonial Dr to Concord St	124	140	**264**	Ties located between grade crossings
LYNX Station	154	160	**314**	Ties located between Amelia St grade crossing and Livingston St grade crossing
Robinson St to Jefferson St	60	60	**120**	Ties located between grade crossings
Jefferson St to Washington St	5	40	**45**	Track 1 ties located between switch and Washington St grade crossing. Track 2 ties located between grade crossings
Washington St to Central Ave	45	49	**94**	Ties located between grade crossings
Central Ave to Pine St	25	28	**53**	Ties located between grade crossings
Pine St to Church St	44	54	**98**	Ties located between grade crossings
Church Street Station	126	120	**246**	Ties located between Church St grade crossing and South St grade crossing
Church Street Station	96	87	**183**	Ties located between South St grade crossing and signal at MP 790.5
Signal at MP 790.5 to East-West Expressway Overhead Bridge	80	33	**113**	Ties located between signal at MP 790.5 and East-West Expressway overhead bridge
America St to Ernestine St	118	68	**186**	Ties located between grade crossings
Ernestine St to Crossover	21	0	**21**	Ties located between Ernestine St grade crossing and crossover
Crossover north of Gore St to Gore St	42	0	**42**	Ties located between crossover and Gore St
Gore St to Crossover south of Gore St	57	77	**134**	Ties located between Gore St and crossover
Crossover south of Gore St to turnout to Track 3	37	77	**114**	Ties located between crossover and turnout to Track 3
Track 1 to 3 Turnout to Columbia Ave	61	0	**61**	Ties located between turnout to Track 3 and Columbia Ave grade crossing
Orlando Amtrak Station	165	450	**615**	Ties located between Columbia Ave grade crossing and south end of Orlando Amtrak station
South end of Orlando Amtrak Station to Kaley St	100	186	**286**	Ties located between south end of Orlando Amtrak station and Kaley St grade crossing
Kaley St to Crossover south of Kaley St	16	19	**35**	Ties located between Kaley St grade crossing and crossover
Sand Lake Rd Station	70	0	**70**	
TOTALS	**6645**	**3558**	**10203**	**8.5' ties**
Pedestrian Crossing 10' Ties 6 EA @ 40 locations (see Section 1.1.D for locations)			**240**	**10' Ties**

CFRC
Central Florida Rail Corridor

Appendix C
Highway Grade Crossing Installation Report

Date Installed: _____

Track (s): _____ MP: _____

Crossing Name: _____

Type of Crossing: _____ (Public, Private, Pedestrian)

Length of Crossing (ft): _____

Rail Weight: _____

Crossing Type Installed _____ (Conc. Panel, Asph. w/ Rubber, etc.)

Panel Manufacturer: _____

Surfaced? _____ Track Stabilizer Used? _____

# of Welds: _____ Slow Order Applied/Duration? _____

Ballast Depth: _____ inches

Perforated Pipe Used/Size? Yes or No Size / _____ inches Bury Depth: _____ inches

Track: _____ Side: E or W

Two 4" Signal Conduit with pull wire installed? Yes or No Bury Depth: _____ inches

Track: _____ Side: E or W

Filter Fabric Used? Yes or No Bury Depth: _____ inches

Contractor's name performing crossing work: _____

Contractor's name performing detour work: _____

Contractor's name performing paving work: _____

Notes: _____

Foreman's Signature: _____ Date: _____

Manager's Signature: _____ Date: _____

Central Florida Rail Corridor

Appendix D

Maintenance of Way Instructions/Standard Drawings
for
Track Renewal & Grade Crossing Upgrade Project

Volume I: Maintenance of Way Instructions

Volume II: Standard Drawings

Volume III: Common Standards

Volume I:

Maintenance of Way Instructions

PURPOSE:	To provide uniform Ballast and Sub-ballast Specifications.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, and Local Environmental Rules and Regulations.

I. DISCUSSION

The CFRC Specifications for Prepared Railroad Track Ballast and Sub-ballast were developed by a team from the Engineering Department.

II. PROCEDURE

A. The detailed specifications follow:

B. These specifications will be used for the purchase of all Track Ballast and Sub-ballast installed on CFRC.

Prepared by: RMW

Reviewed by: _____
Gerry Woods - CFRC Maintenance of Way Manager

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

CFRC

T R A N S P O R T A T I O N

SPECIFICATIONS FOR

PREPARED RAILROAD

TRACK BALLAST and SUB-BALLAST

Approved: December 9, 2013
Revised: May 22, 2014

CFRC

SPECIFICATIONS FOR PREPARED RAILROAD TRACK BALLAST AND SUB-BALLAST

(1) SCOPE:

These specifications cover the requirement for grading and other significant physical properties of mineral aggregates for prepared track ballast and sub-ballast. The suppliers governed by this specification, shall have or establish a quality system that complies with DOT, AAR Specification for Quality Assurance, M1003 (AAR M-1003), or International Quality Standard ANSI 9000 Series (ISO 9001).

(2) TYPES OF BALLAST:

Quarried Granite, Trap Rock, and Dolomite Limestone, produced in a crushing-screening plant designed to satisfy the specifications listed herein.

(3) GENERAL REQUIREMENTS:

The type and sizes of prepared ballast shall be designated by the Railroad in conformance to approved standards. The mineral aggregate shall be clean, hard, durable, free from any frozen lumps, deleterious matter and harmful adherent coatings. No materials subject to regulation as hazardous wastes as defined in the administrative code of the state where the material will be used shall be allowed.

(4) HANDLING:

Processed ballast shall be handled at the producing plant in such a manner that it is kept free from segregation. It shall be loaded only into cars which are clean and free from rubbish or any substance that would foul or damage the ballast. The producer should not make repeated passes of equipment over the same levels in stock piled ballast.

Track ballast shall be washed prior to loading in railcars.

(5) INSPECTION:

The Railroad reserves the right to reject any car of ballast arriving at the site for unloading that does not conform to the specification as determined by methods of test.

If material loaded does not conform to these specifications, the Railroad must notify the supplier to stop loading until the fault has been corrected and to dispose of all defective material without cost to the Railroad.

(6) TESTING:

(A) Determinations of deleterious substances resistance to abrasion and soundness shall be made at a testing laboratory approved by the Railroad. These tests will be conducted when adding a new supplier, renewing contract, opening a new quarry or strata, and at least annually. It is the supplier's responsibility to furnish copies of the annual test results and AAR M-1003, ISO 9001, or DOT certification to CFRC Maintenance of Way Manager.

(B) Visual inspections and gradation test shall be made at the place of production prior to shipment as often as considered necessary. (Minimum of 1 sample per 1000 tons of ballast produced but may be reduced if material consistently meets specification.) Gradation test results will be transmitted by e-mail to CFRC Maintenance of Way Manager. The reports shall be forwarded in a consolidated monthly summary of tests in an electronic format such as Excel. The supplier shall retain the details of gradation for a minimum of one year after the test is performed.

(C) CFRC retains the right to conduct on-site inspection for compliance to this specification. Deviation from these requirements will require the supplier to utilize a CFRC prescribed five step corrective action process designed to identify and permanently eliminate the root cause(s) of the problem.

Define the problem.
Fix the problem.
Identify the root cause of the problem.
Implement corrective action to eliminate the root cause.
Establish a follow-up plan to assess effectiveness and permanence.

Ineffective corrective action plans can result in the supplier being removed from the CFRC approved supplier list.

(D) Samples of the finished product for all tests shall be representative and of sufficient weight for testing.

(7) QUALITY REQUIREMENTS:

(A) Deleterious substances shall not be present in prepared ballast in excess of the following amounts:

Material finer than No. 200 sieve (Track ballast only) = 1%

Clay lumps and Soft or Friable pieces = 0.5%

(If clay lumps and soft or friable pieces exceeds 0.5%, the supplier must test and certify that clay lumps do not exceed 0.5% and soft or friable pieces do not exceed 2%. Action plan must be submitted to reduce this material.)

(B) The percentage of wear of prepared ballast tested in the Los Angeles Machine shall not be greater than:

Granite	=	32%
Dolomite	=	28%

Except as otherwise specified by Railroad

(C) Granite ballast is predominately considered the CFRC Standard. Any deviation must be approved by the CFRC Maintenance of Way Manager. The following guidelines should be followed in determining the type of ballast application for each territorial location:

1. Granite ballast should be used on lines having tonnage in excess of 10 MGT annually.

2. Dolomite Limestone will not be used on CFRC owned tracks without a deviation approved by the CFRC Maintenance of Way Manager.

3.

Dolomite = $MgCo^3$ More Than 36%	-	Approved
Dolomite Limestone = $MgCo^3$ 28-36%	-	Approved
Limestone = $MgCo^3$ Less Than 28%	-	Not Approved
Slag Ballast	-	Not Approved

It is the O&M firm's responsibility to evaluate annual tonnage application when ordering weekly ballast requirements (based on the above guidelines). The Chief Engineer's office will determine the best solution to be administered.

(D) The soundness of prepared ballast for use in regions where freezing temperatures are expected shall be such that when tested:

1. in the sodium sulfate soundness test, the weighted average loss shall not be in excess of 7% after 5 cycles.

   or

2. in the magnesium sulfate soundness test, the weighted average loss shall not be in excess of 11% after 5 cycles.

(8) SUB-BALLAST REQUIREMENTS:

Sub-ballast shall be crusher-run stone or general aggregate base (dense graded aggregate), granite or limestone material that shall meet the requirements as set out in Chapter 1, Part 2, Article 2.11, "SUB-BALLAST SPECIFICATIONS" of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering and relevant sections of this CFRC specification.

(A) Testing: For new materials and new quarries not previously approved by CFRC, testing shall be accomplished to meet the requirements as set out in Chapter 1, Part 2, Article 2.11, Paragraph 2.11.3 "Testing" and Table 1-2-4 of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. Properties testing limits shall be the same as the testing limits for base aggregates as governed by the state or province the project is in. Test results shall be submitted to CFRC Maintenance of Way Manager.

(9) GRADING REQUIREMENTS:

The grading of prepared track ballast and sub-ballast shall be determined by test with laboratory sieves having square openings and conforming to current ASTM Specifications, Designation E-11.

(10) PREPARED RAILROAD TRACK BALLAST AND SUB-BALLAST FOR CFRC SHALL CONFORM TO THE FOLLOWING GRADING REQUIREMENTS:

			SUB BALLAST	
SCREEN SIZE	**MAIN LINE AREMA #4A**	**YARD AREMA #5**	**GA BASE**	**CRUSHER RUN**
2-1/2"	100%			
2"	90 - 100%			
1-1/2"	60 - 90%	100%	100%	100%
1"	10 - 30%	90 - 100%		
3/4"	0 - 10%	40 - 75%	60 - 100%	
1/2"		15 - 35%		
3/8"	0 - 2%	0 - 15%		
NO. 4		0 - 5%		
NO. 8				
NO. 10			30 - 55%	15 - 45%
NO. 60			8 - 35%	
NO. 200			5 - 12%	5 - 12%

(11) METHODS OF TEST:

The supplier shall certify the ballast delivered to the Railroad is typical of that upon which specified tests have been made.

Samples shall be secured in accordance with the current ASTM methods of sampling. Designation D-75.

Sieve analysis shall be made in accordance with current ASTM method of test. Designation C-136.

Material finer than the No. 200 sieve shall be determined in accordance with the current ASTM of test. Designation C-117.

The percentage of clay lumps and soft particles shall be determined in accordance with the current ASTM method of test. Designation C-142.

The resistance to abrasion shall be determined in accordance with the current ASTM method of test. Designation C-131, or C-535, using the standard grading most nearly representative of the size of ballast specified.

Soundness test shall be made in accordance with the current ASTM method of test. Designation C-88.

The weight per cubic foot shall be determined in accordance with the current ASTM method of test. Designation C-29.

Central Florida Rail Corridor

MWI 401-02

Timber Crosstie and
Switch Tie Specifications
Issued: 12/9/13
Revised: 5/23/14

PURPOSE: To provide uniform Timber Crosstie and Switch Specifications.

LOCATION: All CFRC tracks.

I. DISCUSSION

The CFRC Timber Crosstie and Switch Tie Specification has been revised and redesigned as MW-99001 and attached.

Prepared by: RMW

Reviewed by: _____
Gerry Woods - CFRC Maintenance of Way Manager

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

Timber Crosstie and Switch Tie

Procurement Specification

1.0 **Scope** – This procurement specification establishes the minimum detailed technical requirements for Timber Crossties and Timber Switch Ties for use by CFRC. It is CFRC's desire to enter into a long-term contract with suppliers of quality timber crossties and timber switch ties. The suppliers governed by this specification, shall have or establish a quality system that complies with and is certified to the standards set forth in the AAR Specification for Quality Assurance, M1003 (AAR M-1003), or International Quality Standard ANSI 9000 Series (ISO 9001).

1.1 **Crosstie & Switch Tie Description** – Timber crossties and switch ties are used to secure, anchor and support rail, switch, and other track equipment. As such, the consistent quality of crossties and switch ties is of the utmost importance to CFRC for safety and track reliability. The crossties and switch ties acquired under this specification shall be used to meet CFRC field requirements for initial installation at new construction locations, replacement at existing sites, and also for modification at existing locations. Crossties and switch ties acquired for use by CFRC shall as a minimum meet the material quality, dimensional, and processing requirements of sections 3, 4, and 5 of this specification as directed and applied by the contract.

1.2 **Requirements Rating Criteria** – Assignment of specification importance shall be designated by one of the following:

(C) – Critical Characteristic

(M) – Major Characteristic

(I) – Incidental Characteristic

This specification covers two types of ties, timber crossties and timber switch ties. As such, in certain instances, functional requirements specified herein may not be applicable to a particular product. In those cases, the supplier shall respond to the requirement as being not applicable, and explain why it is not. In other instances, in lieu of a defined requirement, this specification may ask for data, or a description for relative comparison.

2.0 **Applicable Documents** – The latest issue of the following document forms a part of this standard to the extent specified herein:

- Applicable Federal, State, and local Regulations

In the event of a conflict between the document referenced here and the detailed content of section 3, 4, and 5, the detail requirements of sections 3, 4, and 5, shall be considered the superseding requirements.

3.0 **Requirements (C)** –

3.1 **General (I)** – The information and requirements included in this section are applicable to timber crossties and switch ties as specified in sections 3.2 and 3.3 respectively of this document.

3.1.1 **Definitions** –

a) **Decay** – Decay is the disintegration of wood substance material due to the action of destroying fungi. "Blue Stain" shall not be considered as decay and is permissible in any wood used for ties.

b) **Rot** – Is the decomposition of wood, which occurs due to age, decay, or chemical disintegration.

c) **Holes** – Within the rail bearing area, a large hole is one more than 1/2 inch in diameter and 3 inches deep. Outside the rail bearing area, a large hole is one which is 1/4 the width of the surface on which it appears and 3 inches deep. Numerous holes are any number equaling a large hole in damaging effect. Such holes may be caused in manufacture or otherwise.

d) **Knots** – Within the rail bearing area, a large knot is one having an average diameter more than 1/3 the width of the surface on which it appears; but such a knot will be allowed if it is located outside the rail bearing area. Numerous small knots equaling the diameter of a large knot in damaging effect shall equate to a large knot and shall have the same limitations.

e) **Shake** – A shake is a separation along the grain, most of which occurs between the rings of annual growth (see Figures A, B, & C below).

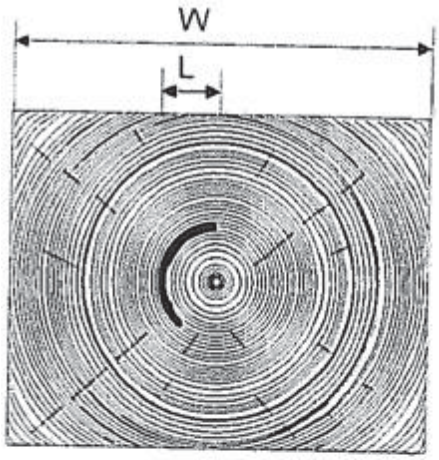


Fig. A

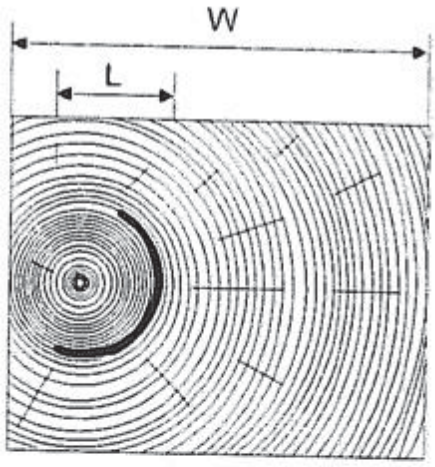


Fig. B

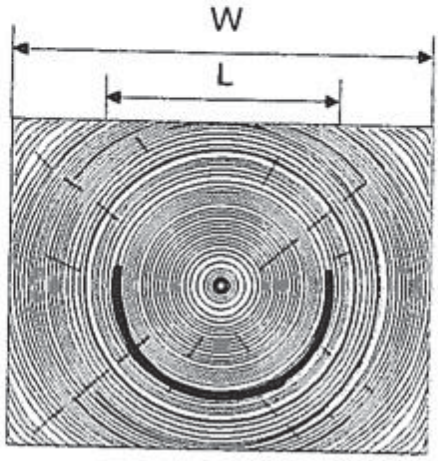


Fig. C

The procedure illustrated in the above diagrams shall be used in determining the length of the shake. One which is not more than 1/3 the width of the tie shall be allowed, provided it does not extend nearer than 1 inch to any surface. Multiple ring shakes shall not be allowed.

f) **Split** – A split is a separation of the wood extending from one surface to an opposite or adjacent surface.

1) In unseasoned ties, a split no more than 1/8 inch wide and/or 4 inches long is acceptable when antisplitting devices have been applied and the tie is brought back to its original sawn dimensions.

2) In a seasoned tie, a split no more than 1/4 inch wide and/or longer than the width of the face across which it occurs is acceptable when antisplitting devices have been applied and the tie is brought back to its original sawn dimensions.

3) Multiple splits of no more than a three way split are acceptable.

4) In no instance will a tie be considered acceptable when a split extends into the rail bearing area.

g) **Checks** –

1) **For procurement of seasoned ties:** A check is a "V" shape groove in a tie similar to a cut made with an ax. A check is acceptable provided it is not more than 3/8 inch wide, the depth not greater than 1/2 the thickness of the tie, and does not extend into the rail bearing area.

2) **For treatment of seasoned ties:** A check is acceptable provided it is not more than 1/2 inch wide, the depth not greater than 1/2 the thickness of the tie, and does not extend into the rail bearing area.

h) **Bark Seams** – Bark seams will not be acceptable if they appear in the rail bearing area. A bark seam or pocket is a patch of bark partially or wholly enclosed in the wood. Bark seams will be allowed provided they are not more than 2 inches below the surface and/or 10 inches long.

i) **Wood Destroying Insect Infestation** – A wood destroying insect infestation is the presence of insects known to destroy wood and other cellulose materials, such as termites, carpenter ants, etc. If an infestation exists, the type of insect will be identified. If termites are detected, the identification must distinguish between Formosan Subterranean termites, and other termite species.

1) All ties shall be inspected for and protected from infestation.

2) If an infestation is found, the tie is not acceptable for use on CFRC.

3) Ties infected with other than Formosan Subterranean Termites will be disposed of in an appropriate manner determined by the supplier.

4) Ties infested with Formosan Subterranean Termites shall be treated to kill the termites and disposed by burning in an environmentally appropriate facility.

j) **Slanting Grain** – Except in woods with interlocking grain, a slant in grain in excess of 1 in 15 will not be permitted, and/or if present in rail bearing area.

k) **Excessive Wane** – Examples of this defect have been

termed in the industry as “Saddlebacks” and “Sledruners”. These conditions in ties shall not be considered acceptable and are illustrated and further defined below.

1) **Saddlebacks** – Saddlebacks between the rail base area will not be accepted if lack of face is more than 1/2 the width (see Fig. D, below).

2) **Sledrunner** – A sledrunner appearing on the end of a tie will not be accepted if lack of face is more than 1/2 the thickness and more than 3 inches from end of tie (see Fig. E, below).

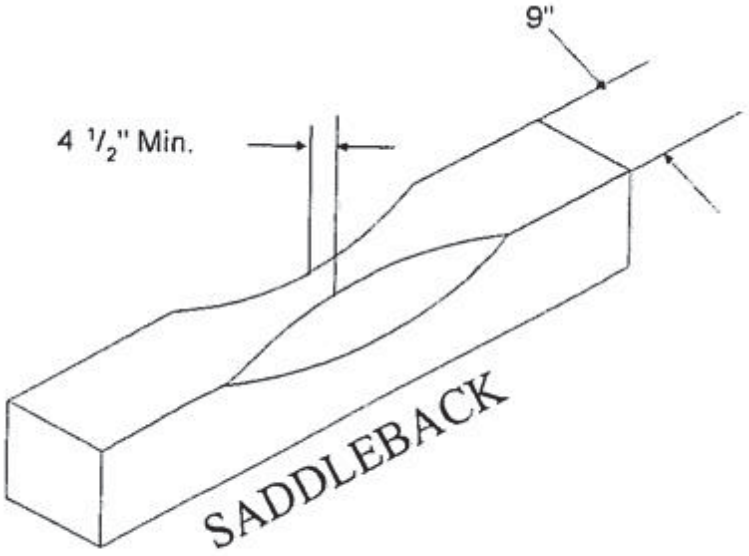


Fig. D

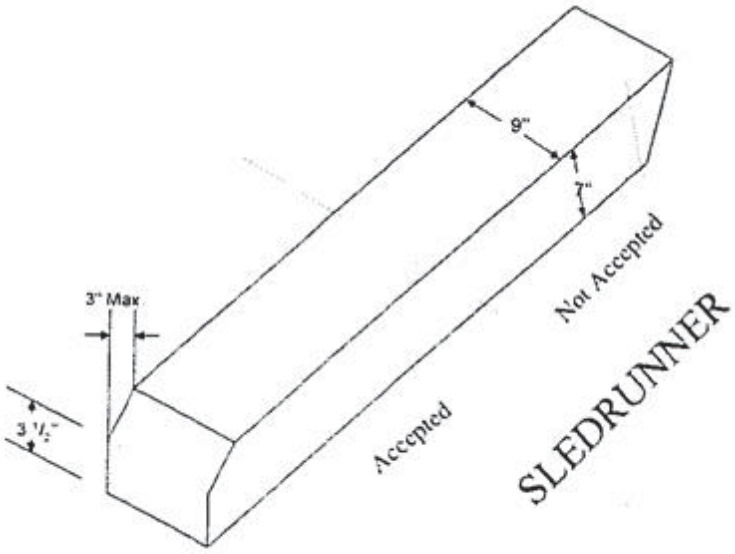


Fig. E

3.2 **Timber Crossties Requirements (C)** –

3.2.1 **Acceptable Materials (C)** - The following types of wood shall be acceptable for the manufacture of timber crossties:

a) Ash

b) Beech

c) Birch

d) Cherry

e) Elm

f) Gum

g) Hackberry

h) Hickory

i) Locust

j) Maple

k) Mulberry

1) Oak {see 3.4.1, b) , 5) }

m) Sassafras

n) Walnut

3.2.2 **Physical Requirements(C)** – Except as hereinafter provided, all crossties shall be free from any defects that may impair their strength or durability as crossties, such as decay, rot, large splits, large shakes, slanting grain, large or numerous holes, or knots.

3.2.2.1 **Manufacture** –

a) All timber crossties shall be straight, well hewed or sawed, cut square at the ends, have bottom and top parallel and the bark entirely removed.

b) All standard timber crossties (see 3.2.2.2 for standard dimensions) shall be considered straight when:

1) A straight line along the top from the middle of one end to the middle of the other end lies more than two inches from either side, **and**

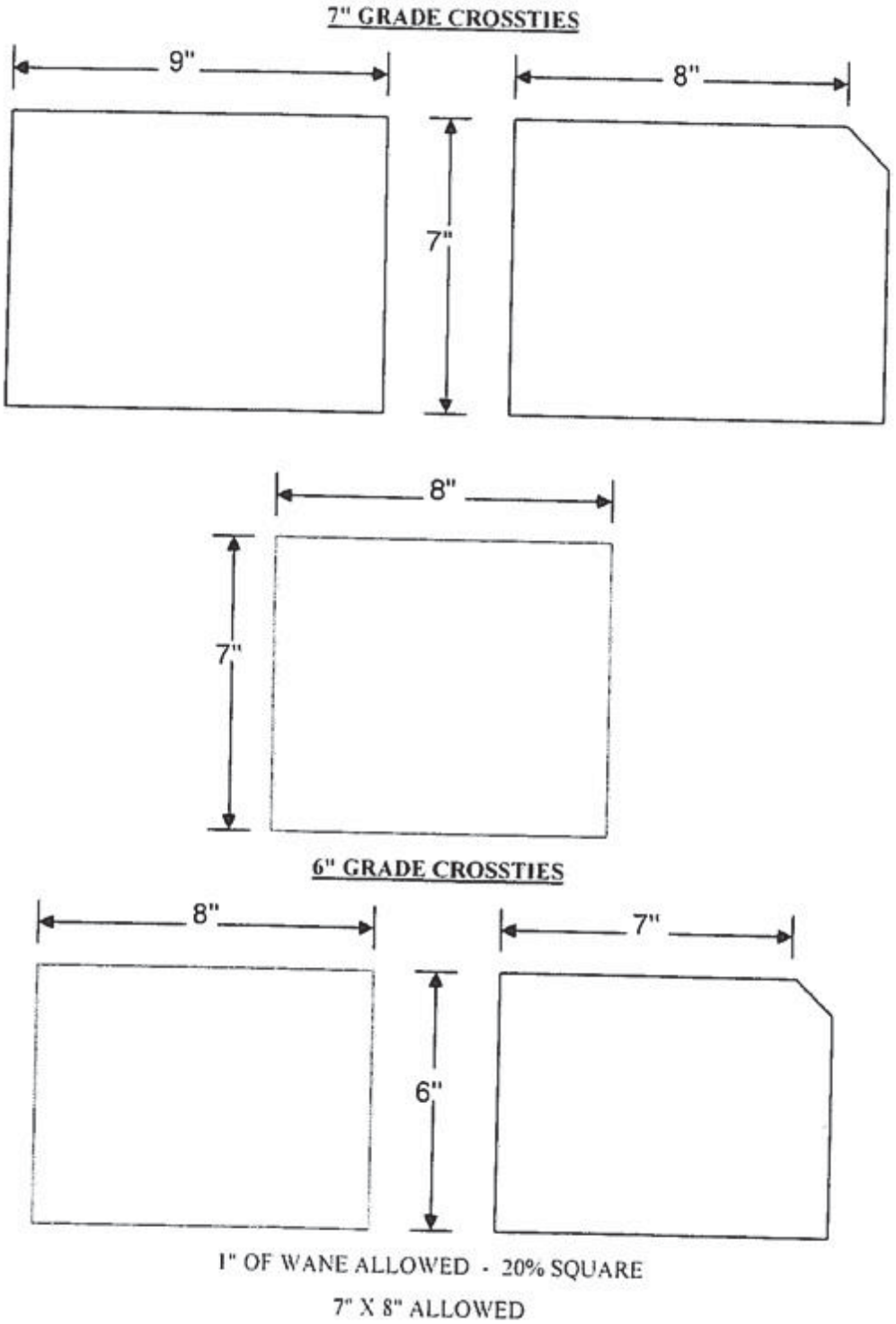
2) A straight line along a side from the middle of one end to the middle of the other end lies more than two inches from the top and the bottom of the tie.

c) A tie is not well hewed or sawed when its surfaces are cut into with score marks more then 1/2 inch deep or when its surfaces are not even.

d) The top and bottom of a tie will be considered parallel

if any difference in the thickness at the ends does not exceed 1/2 inch.

e) The following size categories shall apply for 7” and 6” crossties :



3.2.2.2 **Dimensions** –

a) Except as hereinafter provided, crossties shall measure as follows throughout the rail bearing area. The rail bearing areas as used here and hereafter are defined as those sections of the tie between 20" and 40" from the middle (11" and 31" from its end):

1) Grade 5 – 7" x 9" x 8' 6" Minimum 8" face

2) Grade 4 – 7" x 9" x 8' 6" Minimum 7" face

3) Grade 4 – 7" x 8" x 8' 6" Minimum 7 – 1/2" face – Maximum 2 %

4) Grade 3 – 6" x 8" x 8' 6" Minimum 7" face

b) Ties more than 1 inch longer or shorter than standard shall be rejected.

c) The thickness and widths specified are minimums for the standard sizes.

d) Ties over 1 inch longer, thicker, or wider than the standard size ordered shall be rejected.

e) All thickness and widths shall apply to the sections of the tie between 20 inches and 40 inches from the middle of the tie.

f) All determinations of widths shall be made on the top of the tie, which is the narrower of the horizontal surfaces, or the one with no heartwood if both horizontal surfaces are of the same width.

g) In seasoned ties, thickness and width requirements shall be considered met if not more than 1/4" scant of those specified.

3.2.2.3 **Malformation Tolerances** –

3.2.2.3.1 **Decay** – Crossties with decay shall not be acceptable for use or purchase by CFRC (See para. 3.1.1, a).

3.2.2.3.2 **Rot** – Crossties with rot shall not be acceptable for use or purchase by CFRC (see para. 3.1.1, b).

3.2.2.3.3 **Holes** – Crossties with large holes or several small holes with diameters equaling a large hole shall not be acceptable for use or purchase by CFRC (see para. 3.1.1, c).

3.2.2.3.4 **Knots** – Crossties with large knots or several small knots equaling to a large knot within the rail bearing area shall not be acceptable by CFRC (see para. 3.1.1, d).

3.2.2.3.5 **Shakes** – Crossties with a shake no greater than 1/3 the width of the tie and not nearer than 1 inch to any surface shall be allowed. Multiple ring shakes shall not be allowed (see para 3.1.1, e).

3.2.2.3.6 **Splits** – Crossties with acceptable splits as defined in para. 3.1.1, f) shall be allowed.

3.2.2.3.7 **Checks** – Crossties with acceptable splits as defined in para. 3.1.1, g) shall be allowed.

3.2.2.3.8 **Bark Seams** – Crossties with acceptable bark seams as defined in para. 3.1.1, h) shall be allowed.

3.2.2.3.9 **Slanting Grain** – Crossties with acceptable slanting grain as defined in para. 3.1.1, i) shall be allowed.

3.2.2.3.10 **Excessive Wane** – Crossties with acceptable saddlebacks as defined in para. 3.1.1, j) shall be allowed. Crossties with acceptable sledrunners as defined in para. 3.1.1, j) shall be allowed.

3.2.2.3.11 **Wood Destroying Insect Infestation** – Crossties with wood destroying insect infestation shall **not** be acceptable for use or purchase by CFRC. See para. 3.1.1, i) for disposition instructions.

3.3 **Timber Switch Tie Requirements (C)** –

3.3.1 **Acceptable Materials (C)** – The acceptable types of wood for switch ties are:

a) Oak {see 3.4.1, b), 5)}

b) Black gum

c) Red gum – provided heartwood does not exceed 50%.

3.3.2 **Physical Requirements (C)** – Except as hereinafter provided, all switch ties shall be free from any defects that may impair their strength or durability as switch ties, such as decay, rot, large splits, large shakes, slanting grain, large or numerous holes, or knots.

3.3.2.1 **Manufacturing** -

a) All timber switch ties shall be straight, clean sawed, cut square at the ends, have bottom and top parallel, and the bark entirely removed except as hereinafter provided.

b) A timber switch tie less than 15 foot long shall be considered straight:

1) When a straight line along the top from the middle of one end to the middle of the other end lies more than two inches from either side, and

2) When a straight line along a side from the middle of one end to the middle of the other end lies more than two inches from the top and the bottom of the tie.

c) A timber switch tie 15 foot long or more shall be considered straight:

1) When a straight line along the top from the middle of one end to the middle of the other end is entirely within the tie, and

2) When a straight line along a side from the middle of one end to the middle of the other end lies more than two inches from the top and the bottom of the tie.

d) A timber switch tie is not well hewed or sawed when its surfaces are cut into with score marks more then 1/2 inch deep or when its surfaces are not even.

e) The top and bottom of a timber switch tie will be considered parallel if any difference in the thickness at the ends does not exceed 1/2 inch.

f) Timber switch ties shall be sawed on four sides.

g) Except as hereinafter provided, timber switch ties shall not be less than 9 inches wide throughout the section between 12 inches from each end of the tie.

3.3.2.2 **Dimensions** –

a) Switch ties shall be 7 inches thick.

b) Switch ties shall be provided in the quantities ordered from the following lengths:

1) 9'– 0"

2) 10'– 0"

3) 11'– 0"

4) 12'– 0"

5) 13'– 0"

6) 14'– 0"

7) 15'– 0"

8) 16'– 0"

9) 16'– 6"

10) 23'– 0"

c) The rail bearing area shall be defined as "the section of the switch tie between 12" from each end of the tie."

d) The lengths, thickness and widths specified are minimums for the standard sizes.

e) Switch ties over 1 inch longer, thicker, or wider than the standard size ordered shall be rejected.

f) All thickness and widths requirements are minima and apply to the rail bearing area, which is that section of the tie between 12 inches from each end of the tie.

g) A maximum of 1 inch wane is allowed in the rail bearing area on top or bottom of the tie.

h) All determinations of widths shall be made on the top of the tie, which is the narrower of the horizontal surfaces, or the one with no heartwood if both horizontal surfaces are of the same width.

i) In seasoned ties, thickness and width requirements shall be considered met if not more than 1/4" scant of those specified.

3.3.2.3 **Malformation Tolerances** –

3.3.2.3.1 **Decay** – Switch ties with decay shall not be acceptable for use or purchase by CFRC (See para. 3.1.1, a).

3.3.2.3.2 **Rot** – Switch ties with rot shall not be acceptable for use or purchase by CFRC (see para. 3.1.1, b).

3.3.2.3.3 **Holes** – Switch ties with large holes or several small holes with diameters equaling a large hole shall not be acceptable for use or purchase by CFRC (see para. 3.1.1, c).

3.3.2.3.4 **Knots** – Switch ties with large knots or several small knots equaling to a large knot within the rail bearing area shall not be acceptable by CFRC (see para. 3.1.1, d).

3.3.2.3.5 **Shakes** – Switch ties with a shake no greater than 1/3 the width of the tie and not nearer than 1 inch to any surface shall be allowed. Multiple ring shakes shall not be allowed (see para 3.1.1, e).

3.3.2.3.6 **Splits** – Switch ties with acceptable splits as defined in para. 3.1.1, f), shall be allowed.

3.3.2.3.7 **Checks** – Switch ties with acceptable splits as defined in para. 3.1.1, g), shall be allowed.

3.3.2.3.8 **Bark Seams** – Switch ties with acceptable bark seams as defined in para. 3.1.1, h), shall be allowed.

3.3.2.3.9 **Slanting Grain** – Switch ties with acceptable slanting grain as defined in para. 3.1.1, i), shall be allowed.

3.3.2.3.10 **Wood Destroying Insect Infestation** – Switch ties with wood destroying insect infestation shall **not** be acceptable for use or purchase by CFRC. See para. 3.1.1, i) for disposition instructions.

3.4 **Tie Processing (C)** –

3.4.1 **Unloading and Inspection (I)** – Ties shall be unloaded and passed through a double-end trim saw, which shall expose

interior defects and assures uniform length for mechanical handling at the plant and subsequently in the field.

a) The inspection shall include both ends and all four sides for possible defects.

b) Either a manual or semi-automatic unloading/ inspection system shall record the grade and specie and route the ties into bays designated as follows:

1) Oak Main Line {see 3.4.1, b) , 5)}

2) Oak Branch Line {see 3.4.1, b), 5)}

3) Mixed Hardwood Main Line {see 3.4.1, b), 5)}

4) Mixed Hardwood Branch Line {see 3.4.1, b), 5)}

5) White Oak – It is the intent of CFRC to prohibit the use of white oak ties for both Crosstie and Switch Tie application. This prohibition is being made to minimize and eliminate the occurrence of accelerated deterioration of ties made of white oak in this region. Either mixed hardwood ties or red oak ties shall be shipped to those locations. Red oaks shall be separated from mixed oaks in quantities as directed by CFRC.

6) Culls – All ties not meeting minimum standards for mainline or branchline ties.

c) Ties, which do not meet this specification, are separated as rejects or culls and handled as directed by CFRC Purchasing and Materials in the agreement.

3.4.2**Incising (I)** –

a) Ties shall be incised on four sides not less than $^{1}/_{2}$ inch in depth.

b) Incising shall cover from **end-to-end** on each side of the tie.

c) At least 90% of the teeth contacting the tie shall be in place in each incisor head.

d) **All** ties shall be incised.

3.4.3**Stacking (I)** – Grade ties shall be stacked to provide proper air seasoning.

a) Two to four inches of space shall be left between the ties so as to make continuous flues through the pile or stack.

b) The foundation shall be stacked a minimum of 14” off the ground on treated or other suitable material to prevent transfer of decay.

c) No more than ten stacks or piles shall be placed side by side in a continuous row.

d) A space of at least three feet shall be left between the rows of ties, except where shed drying is used.

e) Firebreaks shall be maintained in accordance with the fire protection plan as established by plant management and approved by local government.

f) The grounds and storage area shall be clear of debris, vegetation, and well drained (No standing water).

g) When possible, rows shall be placed with the open side in the general direction of the prevailing wind.

h) Each row shall carry information painted on the outside of the stack for the purpose of inventory record. Information shall include:

1) pile or row number

2) quantity

3) specie

4) date

5) ownership

3.4.4**Seasoning (C)** – Ties being air seasoned shall be held in stack until the amount of moisture in the wood will permit acceptable penetration and retention of preservative. In general, oak seasons in ten months and mixed hardwoods in six months.

a) The maximum acceptable moisture content in oak shall be 50% using two inch increment borings.

b) The maximum acceptable moisture content in mixed hardwood shall be 40% using two inch increment borings.

3.4.5**Boring and Branding (C)** –

a) Seasoned ties to be treated shall be re-inspected before treatment.

b) Ties that are damaged or split beyond the limitations of this specification shall be removed.

c) Ties shall be branded for identification using $1\ ^{1}/_{2}$ inch lettering, having cutting edges 1/8 inch wide, and impregnated $^{1}/_{4}$ inch into the end of each tie.

d) Branding shall include ownership, origin and year treated.

e) Ties shall have a visible saw kerf mark or some other approved marking to designate the sap side of the crosstie.

3.4.6**Selective End Plates (C)** –

a) Seasoned ties which are split no more than $^{1}/_{4}$ inch wide and with the split extending from one surface to another, shall be clamped and end-plated back to its original sawn dimensions, then returned to the material flow.

b) Unseasoned ties, which are split no more than 1/8 inch wide and/or 4 inches long, shall be clamped and end plated back to its original dimensions, then returned to the material flow.

c) Ties, which cannot be returned to acceptable dimensions, shall be rejected.

3.4.1**Tramming (I)** –

a) Prepared ties shall be loaded on trams and secured with wire banding or chains and counted.

b) The number of ties on each tram shall be counted, verified, and recorded on a tram ticket or plant order.

3.4.8**Treatment (C)** – Ties shall be treated using AWPA Standard P2 creosote, or using a creosote/petroleum blend with the petroleum based creosote component not to exceed 25%, to obtain 7# pcf net retention for oak, and 8.5# pcf for mixed hardwood governed by treating specifications as follows:

3.4.8.1**Rueping Process (AWPA-C-6) (C)** – Properly air seasoned ties (crossties, switch ties, and crossing panels) that meet the moisture content requirements shall be treated using the Rueping process.

a) The creosote shall be maintained at a minimum average of 180° F during the pressure period and pressurized to a maximum of 200 psi for mixed hardwood and 220 psi for oak.

b) The specific treating parameters will vary with the age and construction of the treating plant. The supplier shall have available for CFRC inspection the parameters for his operations. For acceptance the set up parameters must comply with the following:

1)	Hot Oil Treatment:	Oak 180° F/6 hour minimum MHW 180° F/4 $^{1}/_{2}$ hour minimum
2)	Creosote Pressure:	180 - 220 PSI
3)	Temperature:	180 ° - 210 ° F
4)	Vacuum:	Not less than 22”

3.4.8.2**Boulton Drying (C)** – This process shall only be used for ties produced from trees felled within the previous ninety days (three months) and do not meet the moisture content specified in 3, 4, 4 above.

a) Ties shall be trammed with each layer separated by 3/8 inch minimum sticker placed at each end of the ties.

b) The ties shall be heated and boiled in oil under vacuum in the treating cylinder until the moisture content of the wood is low enough to allow proper treatment and meet the requirements of Paragraph 3, 14 AWPA C–6.

3.4.8.3**Inspection of Treating Sheets and Graph (C)** –

a) When the ties are being treated, the plant operator shall maintain a log and a graph, or a graph only if treating controls are automatic, of the following parameters :

1) time (no greater than 15 minute intervals)

2) temperature

3) pressure

4) vacuum

5) creosote tank contents

In the event graph equipment becomes inoperable, inaccurate, or graph becomes illegible, Contractor must cease treatment of ties for CFRC until equipment is repaired.

b) The contractor shall upon request from CFRC provide the log and graph, and the tram ticket for review and inspection.

c) For oak crossties, switch ties, and crossing timbers, a net retention of at least seven pounds per cubic foot, unless refusal takes place.

d) For mixed hardwood crossties, a net retention of at least eight and one half pounds per cubic foot is required, unless refusal takes place.

3.5 **Nail Plates (C)** – Nail Plates shall be the approved method used to control splitting in ties for CFRC.

3.5.1**Nail Plate application** –

a) Ties shall be selectively nail plated prior to treatment.

b) Nail plates shall be applied to both ends of any tie plated.

c) Application of nail plates shall be subject and limited to ties with the maximum split dimension per paragraph 3.1.1, f), of this specification.

d) Ties to be end plated shall have flat, smooth, sawn ends with no spurs.

e) Nail end plates shall be applied by a mechanical device capable of exerting sufficient pressure to close splits bringing the tie back to its original sawn dimensions and with capacity to drive a nail end plate into the end of the tie using a pressure plate.

f) Nail end plates shall be centered on the split (s) as practicable and securely applied against the end of the tie .

g) No part of the nail end plate shall protrude beyond the edge of the tie. The nail end plate shall be positioned to avoid projecting over the edge of tie having the maximum permissible wane. If this is not practical, the protruding edge of the nail end plate shall be ground off, bent over and hammered into the tie, or otherwise treated to remove the potential for hand injuries.

h) Exposed edges of installed nail end plates shall be checked for any burrs and snags made during application, and if found, removed by grinding, filing, or other means to eliminate potential hand injuries when installing the ties.

3.5.2**Nail Plate Design (C)** – (see Figures 3.5.2-1 and 3.5.2-2).

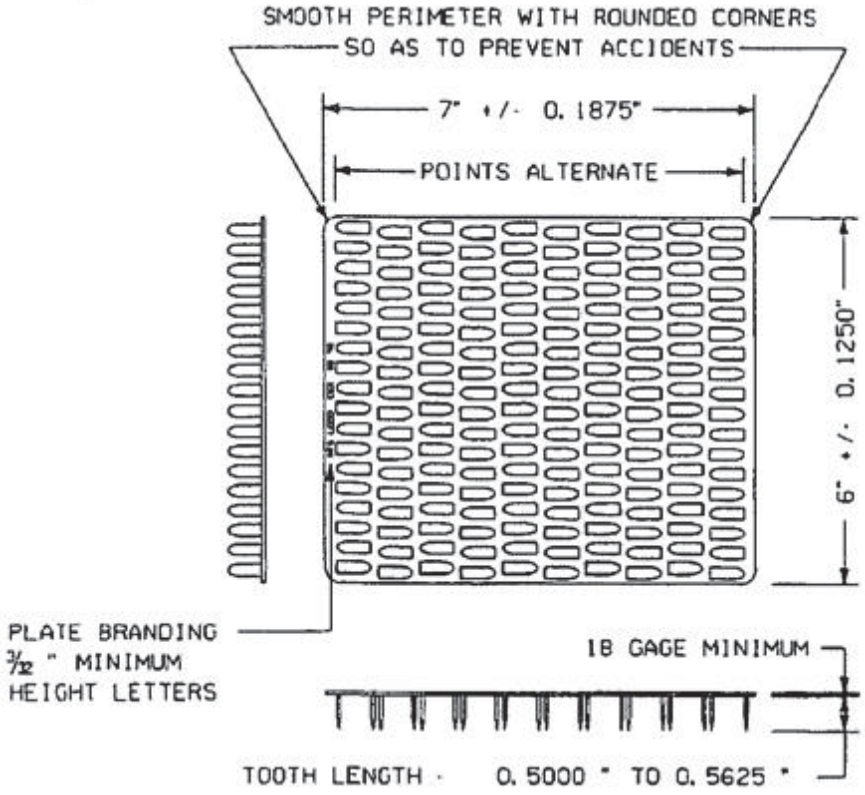
a) The material for nail plates shall be structural steel, ASTM A653, grade 40, 18-gage minimum and hot dipped galvanized, ASTM A924, coating designation G60.

b) The size of the plates and number of teeth per plate shall be as shown on the attached drawings, “Nail Plates for Main Track Ties” and “Nail Plates for Side Track Ties”.

c) Nail end plates shall be branded in 3/32 inch minimum height letters to include plate manufacturers name or symbol, CFRC, plant (two letters), and year (two digits).

Examples of Plant Location Designations:

Florence	*CFRC FL 99*
Green Springs	*CFRC GS 99*
Guthrie	*CFRC GU 99*
Montgomery	*CFRC MO 99*



NOTES.

MATERIAL SPECIFICATION, STRUCTURAL STEEL. ASTM A653, GRADE 4, 18 GAGE MINIMUM. AND HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A924. COATING DESIGNATION G60.

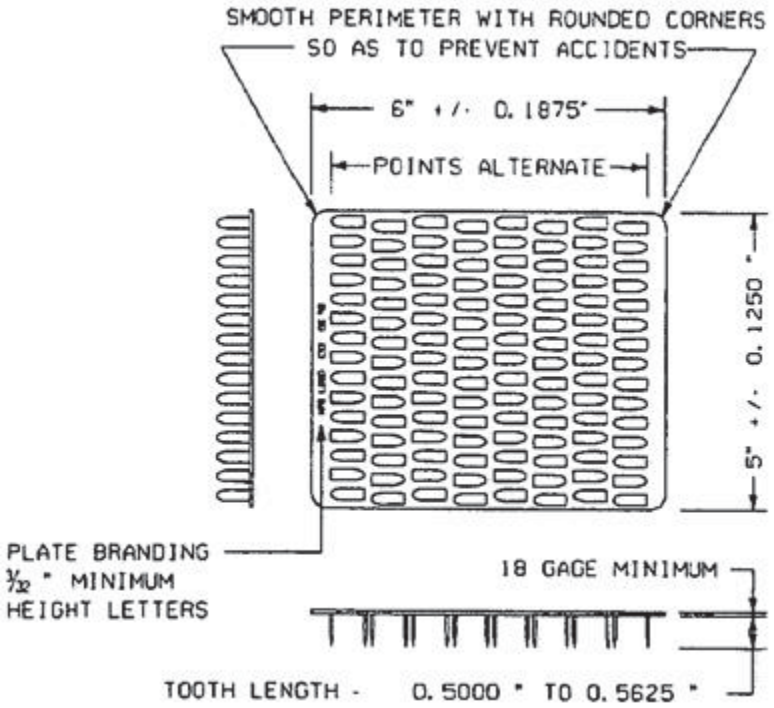
NUMBER AND ALIGNMENT OF ROWS TO BE DETERMINED BY THE PLATE MANUFACTURER. A MINIMUM OF 180 TEETH OR A MINIMUM DENSITY OF 4. 1 TEETH PER SQUARE INCH OF MEASURED PLATE AREA. WHICHEVER PROVIDES THE GREATEST NUMBER OF TEETH, IS REQUIRED.

PLATE FLATNESS, CONCAVITY OR CONVEXITY MEASURED WITH A STRAIGHT EDGE AND TAPER GAGE ACROSS EITHER THE WIDTH, LENGTH OR DIAGONALS ON THE TOOTHLESS SIDE SHALL NOT EXCEED 0.03125".

BRAND LOCATION TO BE SELECTED BY MANUFACTURER OF PLATE.

NAIL PLATE
FOR MAIN TRACK TIES

Figure 3.5.2-1



NOTES.

MATERIAL SPECIFICATION, STRUCTURAL STEEL, ASTM A653, GRADE 4, 18 GAGE MINIMUM, AND HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A924, COATING DESIGNATION G60.

NUMBER AND ALIGNMENT OF ROWS TO BE DETERMINED BY THE PLATE MANUFACTURER. A MINIMUM OF 120 TEETH OR A MINIMUM DENSITY OF 4. 0 TEETH PER SQUARE INCH OF MEASURED PLATE AREA, WHICHEVER PROVIDES THE GREATEST NUMBER OF TEETH, IS REQUIRED.

PLATE FLATNESS, CONCAVITY OR CONVEXITY MEASURED WITH A STRAIGHT EDGE AND TAPER GAGE ACROSS EITHER THE WIDTH, LENGTH OR DIAGONALS ON THE TOOTHLESS SIDE SHALL NOT EXCEED 0.03125".

BRAND LOCATION TO BE SELECTED BY MANUFACTURER OF PLATE.

NAIL PLATE
FOR SIDE TRACK TIES

Figure 3.5.2-2

3.6 **Environmental (C)** –

3.6.1 **Environmental Regulations** – All material shall comply with current environmental regulations.

3.6.2 **Disposal Hazards** – Material posing a possible disposal hazard, such as preservatives, insecticides or other sensitive disposables, shall be indicated in documentation and presented at the supplier vendor forum.

3.7 **Safety (C)** – The supplier shall observe all applicable Federal, State, and Local safety and operating rules and regulations.

3.8 **Workmanship (C)** – All ties and related components shall be manufactured, finished and comply with all AAR, and FRA standards for workmanship and/or certification.

4.0 **Quality Assurance Provisions (C)** –

a) The supplier shall be responsible for insuring that the delivered ties meet the requirements as identified in the applicable paragraphs of this specification and as directed in the contract agreement.

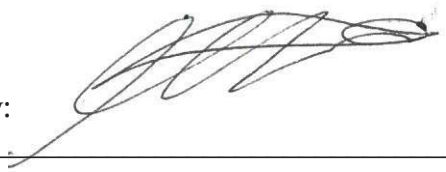
b) CFRC also reserves the right to perform ad-hoc no notice inspections at the manufacturing plant or in the field to evaluate ties for quality and conformance with this specification.

c) Final acceptance of ties shall be based on destination inspection by CFRC at the location designated by CFRC in the agreement.

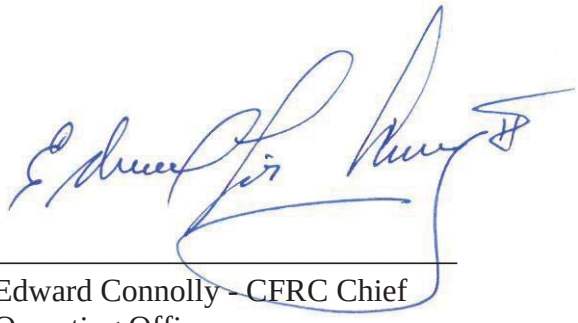
5.0 **Transportation (M)** – CFRC shall provide transportation direction with each order. The supplier shall ship via truck or rail to destinations as directed by CFRC with each order.

6.0 **Notes** – This section not used.

Prepared by: RMW

Reviewed by: 

Gerry Woods - CFRC Maintenance of Way Manager

Approved by: 

Edward Connolly - CFRC Chief Operating Officer

MWI 403-02

Specifications and Use of Nail Plates for Cross and Switch Ties
Issued: 12/9/13
Revised: 5/28/14

PURPOSE: To establish the specification for Nail Plates used to control splitting in Cross Ties and the procedure for their installation.

LOCATION: All CFRC tracks.

I. DISCUSSION

The CFRC Specifications and Use of Nail Plates for Cross and Switch Ties has been now included in MW-99001 and is attached to MWI 401-02.

Prepared by: RMW

Reviewed by: _____
Gerry Woods - CFRC Maintenance of Way Manager

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

PURPOSE:	To establish uniform instructions governing the use of Transition and Compromise Rails.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local Environmental Rules and Regulations.

I. DISCUSSION

A. Transition and compromise rails are specially manufactured track components that allow the safe and efficient connection of two different rail sections. **Transition rails** are fabricated from one rail section with the railhead planed or machined to conform to the worn rail section. **Compromise rails** are fabricated from two rail sections with a special forging joining the two rail sections. Transition and compromise rails are used to replace both compromise welds and bolted compromise joints in CWR territory.

B. Transition and compromise rails may be required in programmed rail maintenance, such as curve patch and out of face rail relays or other project and maintenance activities such as turnout or road crossing replacement. The decision of where transition or compromise rails will be used should be made during the pre-installation inspection / planning trip as described in MWI 1101. The criteria used to determine if a transition rail is required is when all of the following are met:

1. Class 2 or higher track ***and***

2. 5 MGT or higher ***and***

3. When the total rail height difference is greater than 1/4” if rails to be joined by thermite welding and 1/8” if rails to be joined by flash-butt welding.

   Example: Joining new 141RE to 136 RE with 3/16” wear. The total difference is 5/16” and the universal transition rail would be cut to approximately 16’-2” long.

C. Transition and compromise rails should be used in other maintenance activities at locations that have high tonnage or a history of continuing compromise weld / bolted joint failures. The criteria in paragraph B should be used as a guide.

D. [Removed]

E. Transition and compromise rails, if made from relay rail, will be certified to be free of defects per MWI 508.

F. Center of gravity lift point will be marked for transition and compromise rails.

G. All flash butt welds will be magnaflux tested.

II. PROCEDURE

A. Installation procedure for transition and compromise rails.

1. Use all the required PPE and ensure that a proper job briefing is conducted before beginning this work.

2. Identify the area of the compromise between the rail sections. Keep in mind that:

   a) The forged transition zone (normally 10 ½" long) on compromise rails must be centered between ties to ensure that standard tie plates can be used.

   b) The transition zone of compromise rails should not be located on open deck bridges or within a turnout on the long ties.

   c) Where possible, the field welds in the adjacent rail should not be opposite each other.

   d) It is normally desirable to remove as much of the smaller rail section as possible.

3. Examine the compromise area for wear and determine the height of the rail.

4. The smaller rail section end of the transition or compromise rail will have a rail height that varies from 1/4" worn at the end to full rail height near the center. Mark the location on the transition or compromise rail where the rail height equals the existing rail height. This will be your saw cut location on the transition rail.

5. NOTE: The minimum length plug rail permitted in track will be as described in MWI 801 (*Welding Manual*). A shorter length is acceptable if a Flash Butt welder is utilized.

6. Compromise rails from 115RE to larger rails are handed left or right because of the different head widths. The gage side should be straight in the line between the two rail sections. To identify a left or right handed compromise rail:

A. Stand along outside the gage of the track, facing the gage (straight) side of far rail.

B. The larger rail section will be on the end corresponding to its hand.

C. See figure in Appendix B. It is a right hand compromise rail.

7. Mark the saw cut locations on the existing rail. The cut locations should be in a crib to facilitate welding. The cut must be at least 18 inches from the plant weld used by the manufacturer in the fabrication of the transition or compromise rail. Refer to MWI 801, Welder's Manual, for minimum weld to weld distance on the existing rail.

8. Check to see that the shortened transition or compromise rail will still fit properly.

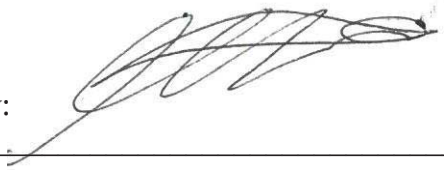
9. Cut the rails and place the transition or compromise rail in the gap.

10. Weld the transition rail or compromise in place using either the in-track welder or thermite welding. Be sure to follow the proper procedures for the welding method selected. See MWI 801, *Welding Manual*.

B. Transition rails will be requisitioned electronically through the Purchasing and Materials Department. At the present time, the following designs have been approved:

Stock Control #	*Description*
013.1321150.1	Rail, Compromise, 132RE (new) / 115RE (1/4" worn) RH, 19'-4"
013.1151150.1	Rail, Transition, 115RE (new) / 115RE (3/8" worn) 20'
013.1321151.1	Rail, Compromise, 132RE (new) / 115RE (1/4" worn) LH, 19'-4"
013.1321220.1	Rail, Compromise, 132RE (new) / 122CB (1/4" worn) 19'-4"
013.1361150.1	Rail, Compromise, 136RE (new) / 115RE (1/4" worn) RH, 19'-4"
013.1361151.1	Rail, Compromise, 136RE (new) / 115RE (1/4" worn) LH, 19'-4"
013.1361220.1	Rail, Compromise, 136RE (new) / 122CB (1/4" worn) 19'-4"
013.1361320.1	Rail, Transition, 136RE (new) / 132RE (1/4" worn) 20'
013.1411150.1	Rail, Compromise, 141RE (new) / 115RE (1/4" worn) RH, 19'-4"
013.1411151.1	Rail, Compromise, 141RE (new) / 115RE (1/4" worn) LH, 19'-4"
013.1411220.1	Rail, Compromise, 141RE (new) / 122CB (1/4" worn) 19'-4"
013.1411270.1	Rail, Compromise, 141RE (new) / 127DY (1/4" worn) 19' -4
013.1411320.1	Rail, Transition, Universal, 141RE (new) / 136RE (new) / 132RE (new) / 132RE (1/4" worn) 26'-8"
013.1411360.1	Rail, Transition, 141RE (new) / 136RE (1/4" worn) 19' -4"
013.1411401.1	Rail, Transition, 141RE (new) / 140RE (1/4" worn) 20'

Prepared by: RMW

Reviewed by: 

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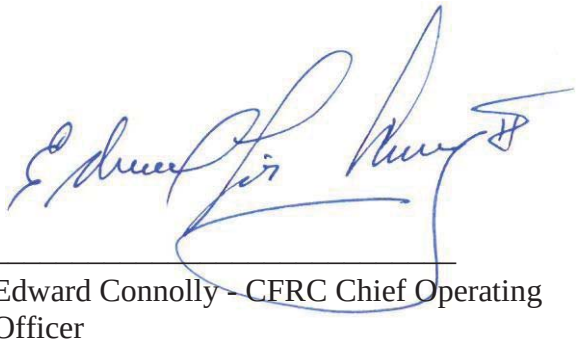
Gerry Woods - CFRC Maintenance of Way Manager

Approved by: 

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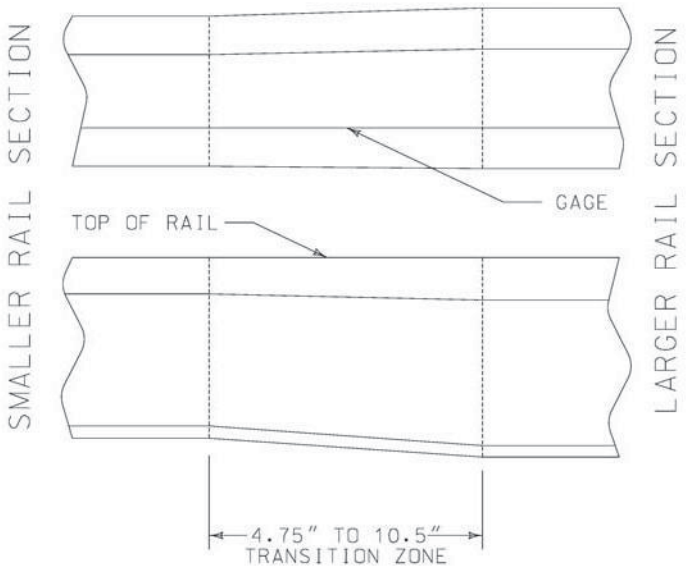
Edward Connolly - CFRC Chief Operating Officer

APPENDIX A



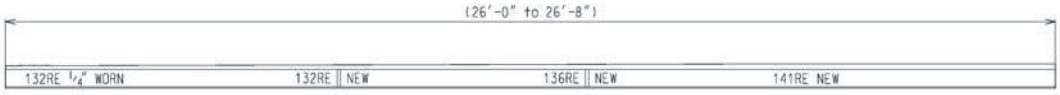
NOTES:

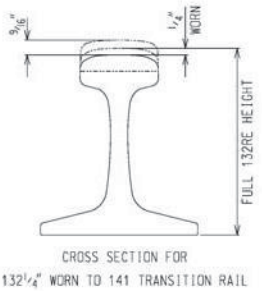
WEBS TO BE SMOOTH AND FREE OF DISCONTINUITIES

LENGTH PER PURCHASE ORDER

IF WORN SECTION ORDERED, MACHINING TO BE APPLIED GRADUALLY AND UNIFORMLY.

GENERAL ARRANGEMENT FOR COMPROMISE RAILS





NOTES:

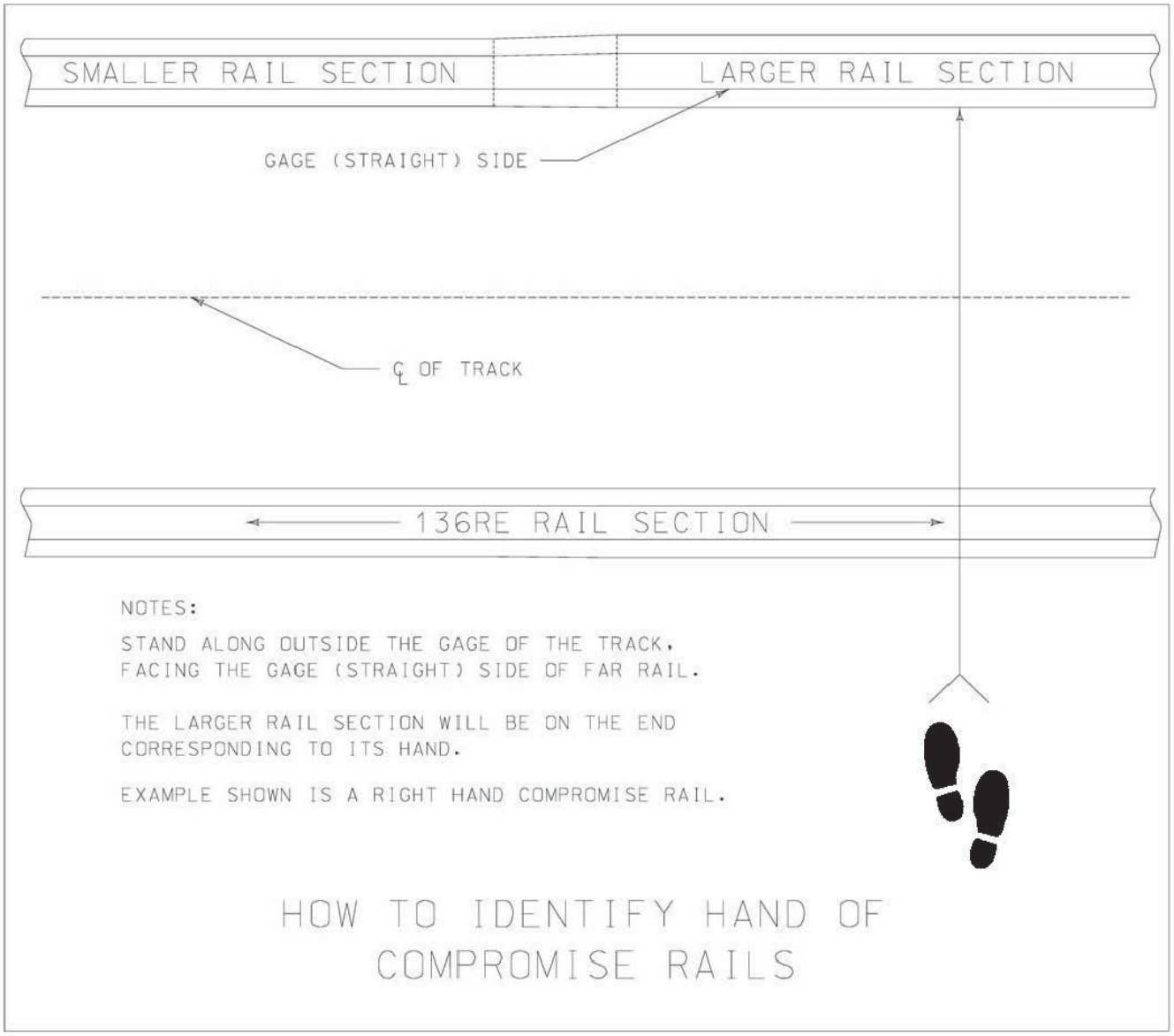
TRANSITION TO BE SMOOTH AND CONSISTENT

LENGTH PER PURCHASE ORDER

MACHINING TO BE APPLIED GRADUALLY AND UNIFORMLY.

GENERAL ARRANGEMENT FOR TRANSITION RAILS

APPENDIX B



HOW TO IDENTIFY HAND OF COMPROMISE RAILS

PURPOSE:	To provide uniform instructions for Anchoring the Track Structure.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local Environmental Rules and Regulations.

I. DISCUSSION

A. Rail anchors are essential in achieving a stable track structure. They are designed to prevent longitudinal movement of the rail and work together with the other components of the track structure to prevent buckling.

B. Rail anchors are required on both jointed and continuously welded rail tracks. They will be applied before the track is returned to service.

C. All tracks, which are not in compliance with this rail anchoring policy, will be brought up to standard during the nextRail Laying, Curve Patch, or Bridge Timbering operation. During Timbering operations, missing anchors will be replaced to match the pattern currently in track. Tracks, that have a history of buckling or excessive rail movement, will be reviewed by the Chief Engineer on a case-by-case basis to establish a date for compliance. If the next cycle is too far away, a schedule for compliance will be prepared by the Chief Engineer and approved by the CFRC Maintenance of Way Manager.

D. New rail anchors will be manufactured from mill certified steel.

E. Relay rail anchors will not be used on main tracks or passing sidings when laying new rail by rail teams. Rail anchors removed to perform other maintenance activities may be reinstalled if effective.

II. PROCEDURE

A. All Track

1. To avoid tie skewing, anchors should be applied against the same tie on opposite rails. (Opposite rails should be anchored the same)

2. Definition: Box Anchor – Anchors applied against both sides of the tie on opposite rails to restrain longitudinal rail movement in both directions. [Four (4) rail anchors per tie.]

B. Jointed Rail Territory

The track will have 16 rail anchors per 39 ft. rail. Box anchor 8 ties per rail length spaced in accordance with Rail Anchor Pattern Sketch shown on page 5, where practical.

C. Continuous Welded Rail Territory

1. Definition: Continuous Welded Rail (CWR) – A number of rails welded together into lengths exceeding 400 feet.

2. When laying continuous welded rail (CWR), it will be box anchored on every other tie throughout the entire section of CWR. Additional rail anchors are required at the following locations:

    a. Joints installed in CWR will be box anchored on every tie for 130 consecutive ties in each direction within 60 days except ties supporting rail joints.
    b. Curves 3 degrees and greater on main track and sidings – CWR being installed will be anchored on every tie. (Anchors applied against both sides of each tie.)
    c. Turnouts - CWR will be box anchored on every tie for 130 consecutive ties in each direction from the long ties of the turnout.
    d. Railroad Crossings - CWR will be box anchored on every tie for 130 consecutive ties in each direction from the railroad crossing.
    e. Road Crossings - CWR will not be anchored within the road crossing unless required by the design of the road crossing surface material. If the road crossing is 50 ft. wide or greater, CWR will be box anchored on every tie for 130 consecutive ties in each direction from the road crossing.
    f. All Open Deck Bridge Approaches - CWR will be box anchored on every tie for 130 consecutive ties in each direction from the backwall of the bridge.
    g. Epoxy Bonded Insulated Joints - Structurally sound epoxy bonded insulated joints do not require additional anchors.

3. CWR laid across bridges will be anchored as follows:

    a. Ballast Deck Bridges - CWR will use the standard anchor pattern as described in paragraph II.C.2.

b. Open Deck Bridges with total length 100 ft or less - CWR will be box anchored on every tie that is fastened to the bridge span.
c. Open Deck Bridges with total length between 100 ft. and 500 ft. with an alignment of 2 degrees or less:

    1) CWR will be box anchored on every tie that is fastened to the bridge span, throughout all spans less than 100 ft.
    2) CWR will be box anchored on every tie that is fastened to the bridge span, for the first 100 ft. from the fixed end of individual spans with length greater than 100 ft.

d. Rail anchor pattern will be specified by the CFRC Maintenance of Way Manager when any of the following conditions exist:

    1) Open Deck Bridges with a total length greater than 500 feet
    2) Alignment is greater than 2 degrees
    3) Bridges with existing rail expansion joints
    4) Other special situations

4. Turnouts within CWR territory will have every tie box anchored, where anchors can be applied, on both the straight side and diverging side of the turnout. Care must be taken to ensure that anchors do not interfere with the movable portion of the switch. Ensure that the requirements in paragraph II.C.2.d. are met. Ties with positive restraint rail fasteners are considered to be anchored.

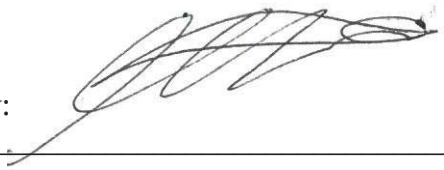
5. Ties that have a positive restraint fastener on one end only should be box anchored on the other end. MWI 701, *Use of Premium Rail Fasteners in CWR*, details the use of these fasteners.

6. At some locations, there may be two or more of the above situations present. In that case the requirements will be additive.

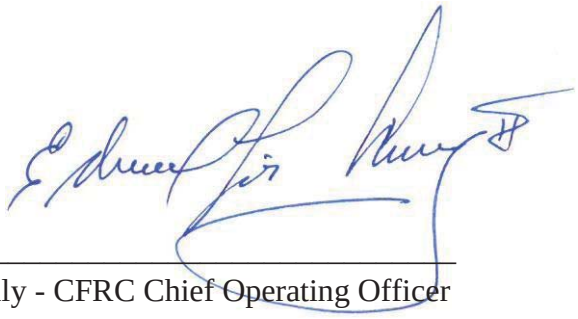
    For example: A turnout located 100 ft. from an open deck bridge (75 ft. long). In this example, the CWR will be box anchored on every tie between the backwall at the end of the bridge and the turnout. The turnout will be box anchored on every tie, where anchors can be applied, on both the straight side and diverging side of the turnout. The CWR will be box anchored on every tie for 130 ties beyond long ties of the turnout.

7. Rail Anchor Patterns are illustrated on attached plans.

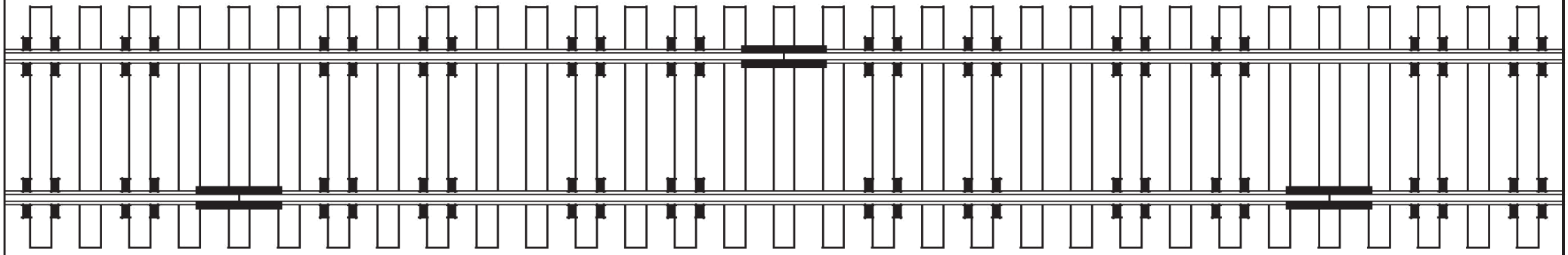
Prepared by: RMW

Reviewed by: 

Gerry Woods - CFRC Maintenance of Way Manager

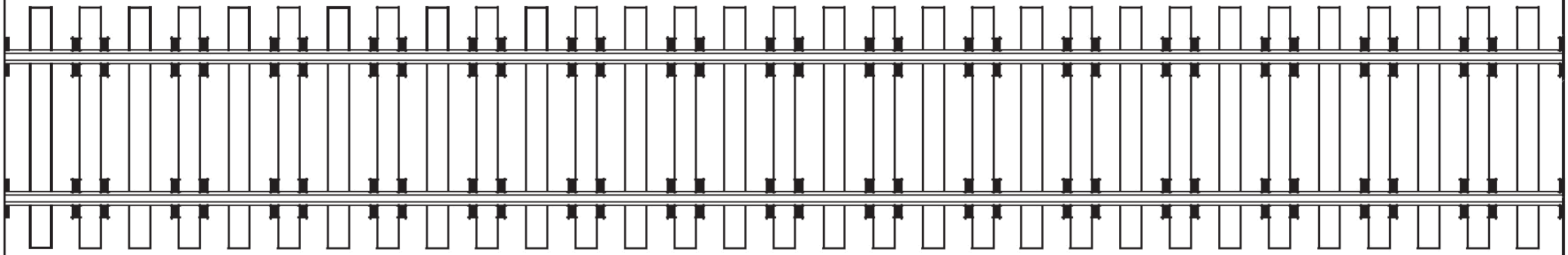
Approved by: 

Edward Connolly - CFRC Chief Operating Officer



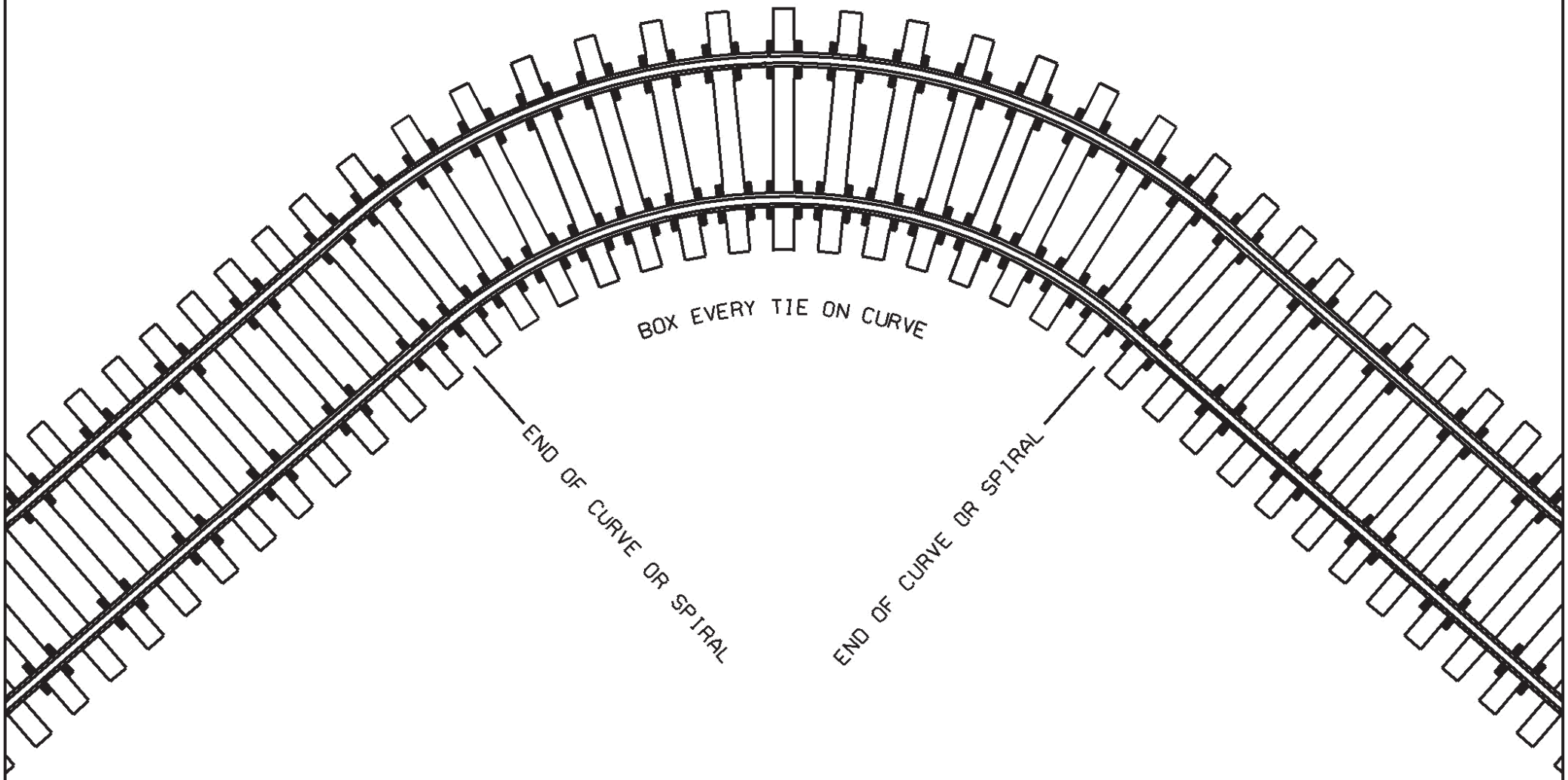
JOINTED RAIL - 16 ANCHORS PER 39 FOOT RAIL, BOX ANCHOR 8 TIES.

RAIL ANCHOR PATTERNS



WELDED RAIL - TANGENTS AND CURVES LESS THAN 3 DEGREES - BOX ANCHOR EVERY OTHER TIE.
SAME PATTERN FOR BALLAST DECK BRIDGES.

RAIL ANCHOR PATTERNS

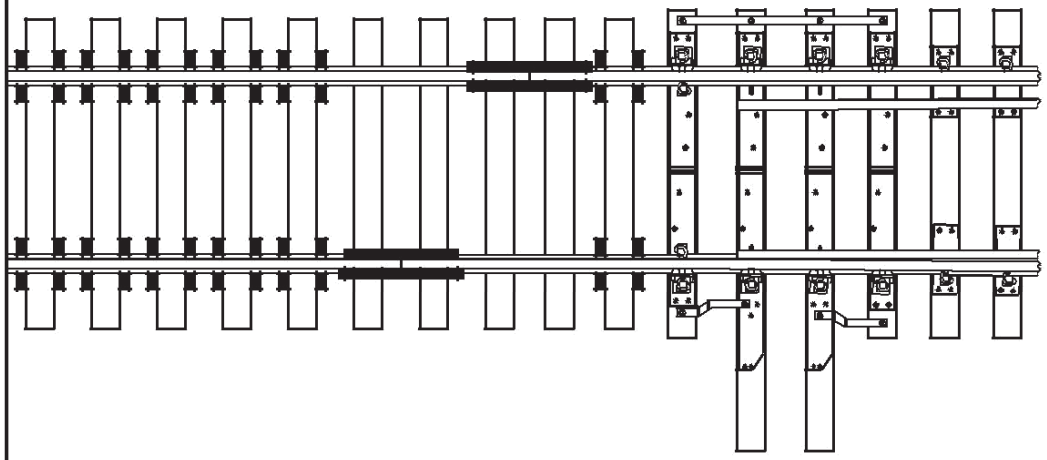


WELDED RAIL - CURVES, 3 DEGREES AND GREATER
BOX ANCHOR EVERY TIE ON CURVE AND SPIRALS

RAIL ANCHOR PATTERNS

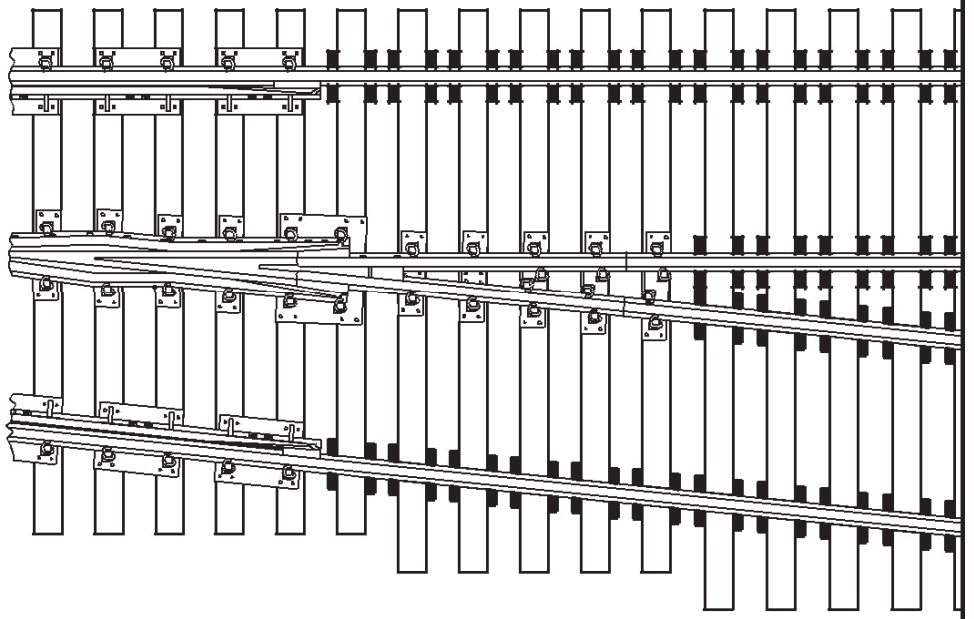
AHEAD OF SWITCH POINT :

- BOX ANCHOR EVERY TIE FOR 130 TIES. COUNT FROM FURTHEST JOINT FROM SWITCH POINT OR FROM TIE AHEAD OF BRACE PLATES IF STOCK RAILS ARE WELDED INTO TRACK.
- IF JOINT BARS ARE PERMANENT, DO NOT APPLY ANCHORS OPPOSITE BARS



BEHIND HEEL OF FROG :

- BOX ANCHOR EVERY TIE FOR 130 TIES ON BOTH THE THROUGH TRACK AND TURNOUT TRACK. COUNT FROM THE LAST LONG TIE.
- BOX ANCHOR EVERY TIE TO END OF GUARD RAIL.



- BETWEEN SWITCH HEEL AND TOE OF FROG, BOX ANCHOR EVERY TIE THAT CAN BE ANCHORED ON AS MANY RAILS AS POSSIBLE. (REFER TO APPLICABLE STANDARD DRAWINGS)

WELDED RAIL ANCHOR PATTERN ADDITIONS

MWI 703-07
6/5/14
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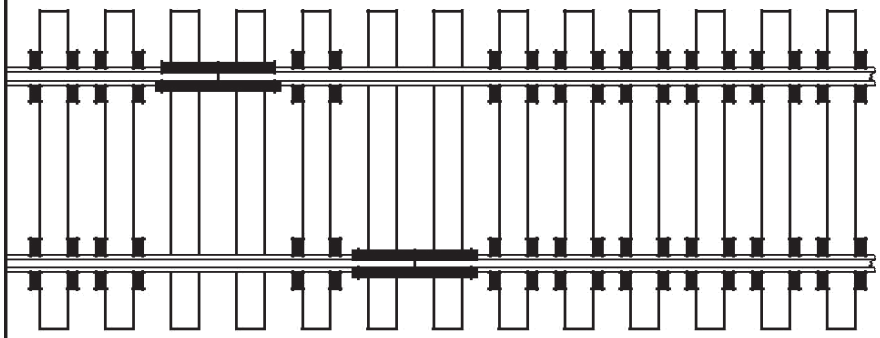
BOTH SIDES OF RAIL JOINTS :

- BOX ANCHOR EVERY TIE FOR 130 TIES.

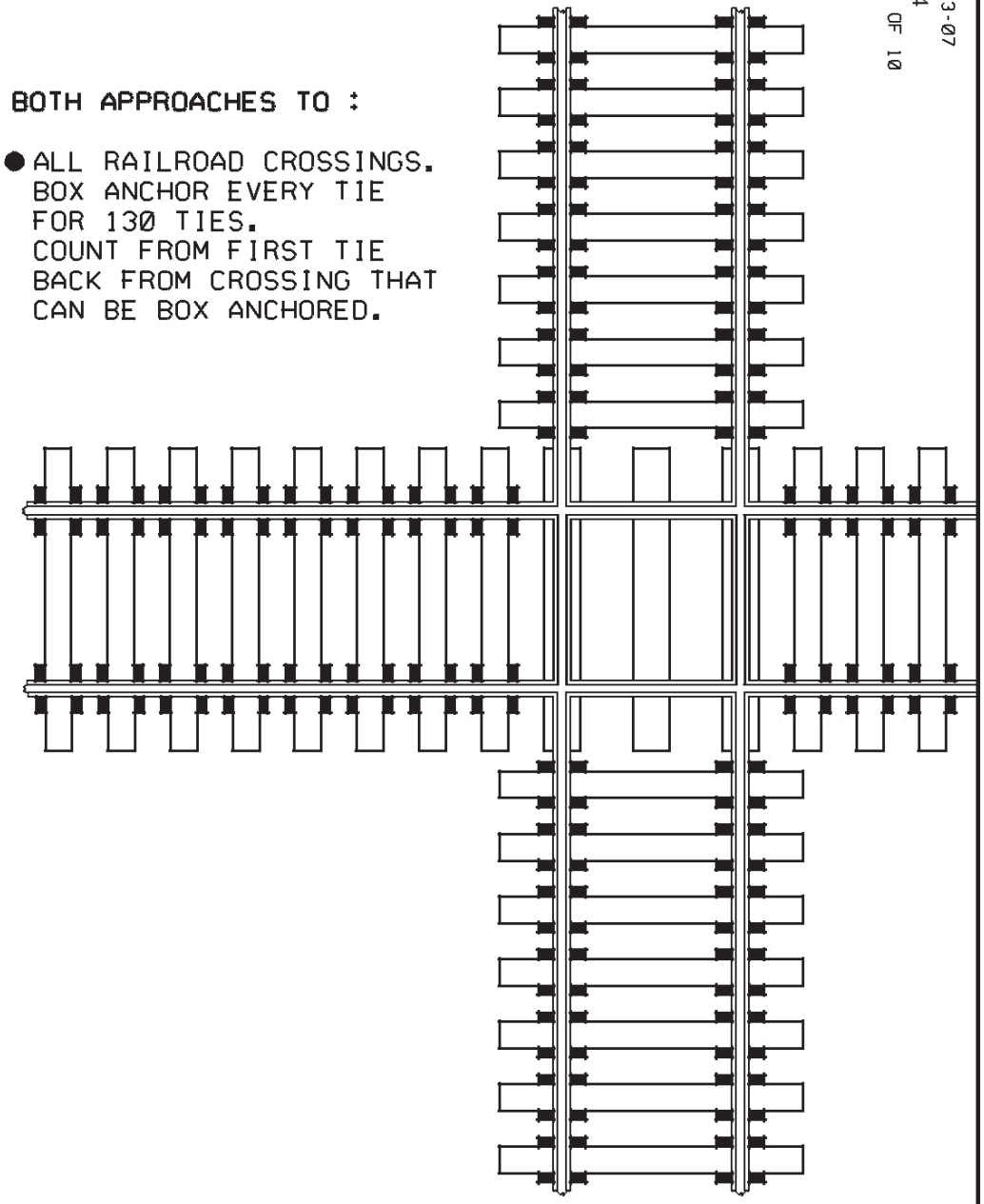
USE NORMAL ANCHOR PATTERN FOR :

- EPOXY GLUED INSULATED JOINTS.
- JOINTS WHICH ARE TO BE WELDED AS THE RAIL IS BEING LAID OR IMMEDIATELY AFTER IT IS LAID.



BOTH APPROACHES TO :

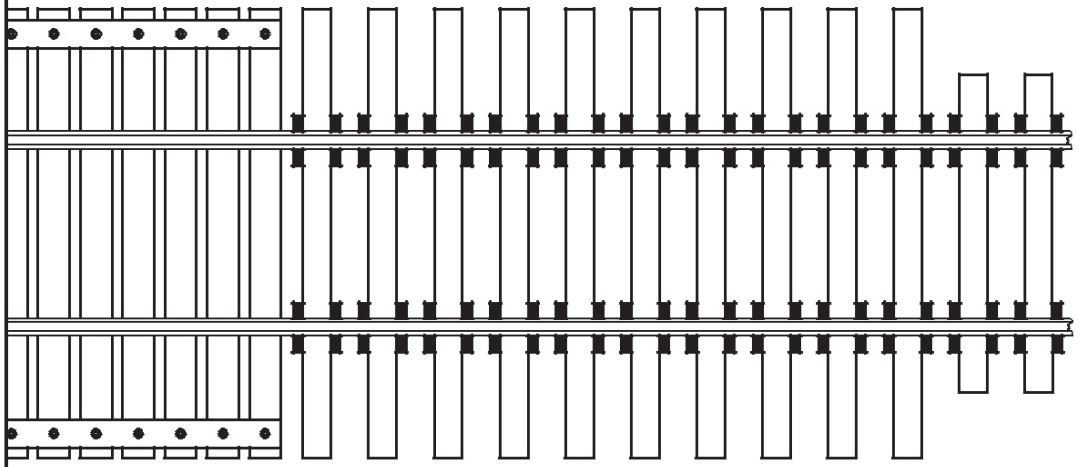
- ALL RAILROAD CROSSINGS. BOX ANCHOR EVERY TIE FOR 130 TIES. COUNT FROM FIRST TIE BACK FROM CROSSING THAT CAN BE BOX ANCHORED.



WELDED RAIL ANCHOR PATTERN ADDITIONS

BOTH APPROACHES TO :

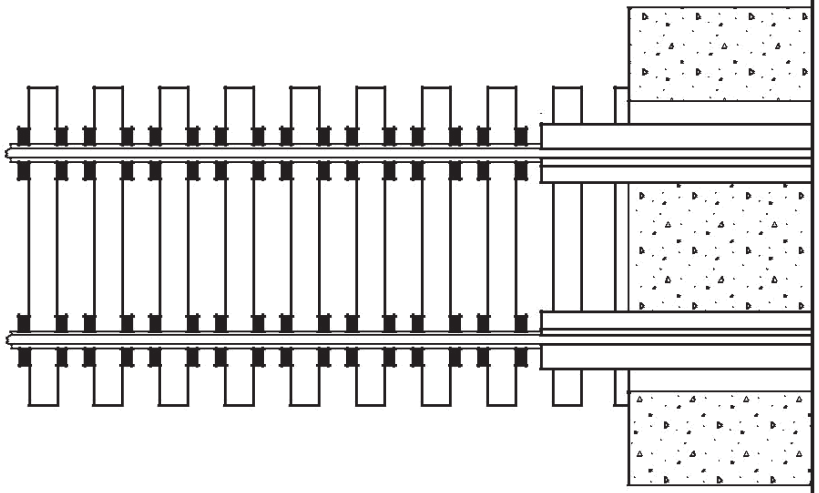
- ALL OPEN DECK BRIDGES.
  BOX ANCHOR EVERY TIE FOR 130 TIES.



COUNT FROM BACKWALL OF BRIDGE.

BOTH APPROACHES TO :

- ROAD CROSSINGS 50 FOOT OR GREATER.
  BOX ANCHOR EVERY TIE FOR 130 TIES.
- ROAD CROSSINGS UNDER 50 FOOT.
  USE NORMAL ANCHOR PATTERN.



COUNT FROM FIRST TIE BACK
FROM END OF CROSSING OR FROM
JOINTS FOR CROSSING WARNING
IF NOT EPOXY GLUED JOINTS.

WELDED RAIL ANCHOR PATTERN ADDITIONS

MWI 703-07
6/5/14
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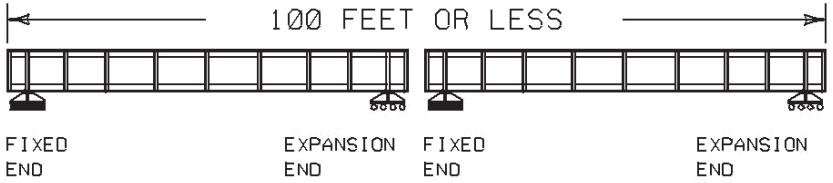
OPEN DECK BRIDGES WITH A TOTAL LENGTH OF 100 FEET OR LESS :

- RAIL ANCHORS WILL BE APPLIED ON ALL TIES FASTENED TO THE BRIDGE SPAN.



OPEN DECK BRIDGES WITH TOTAL LENGTH BETWEEN 100 FEET AND 500 FEET :

RAIL ANCHORS WILL BE APPLIED WITHIN THE LENGTH DESIGNATED ON ALL TIES FASTENED TO THE BRIDGE SPAN.

- RAIL ANCHORS WILL BE APPLIED THROUGHTOUT ALL SPANS LESS THAN 100 FEET.
- RAIL ANCHORS WILL BE APPLIED FOR THE FIRST 100 FEET MEASURED FROM THE FIXED END FOR INDIVIDUAL SPANS WITH LENGTH GREATER THAN 100 FEET.

WELDED RAIL ANCHORING ON OPEN DECK BRIDGES

PURPOSE:	To establish a policy governing the Selection and Installation of Insulated Joints.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local Environmental Rules and Regulations.
RELATED DOCUMENTS:	MWI 705, Insulated Joint Escalation Plan Drawing 2505, Epoxy Bonded Insulated Joint for 132RE, 136RE and 141RE Rail.

I. DISCUSSION

A. Insulated Joints are necessary for the safe operation of signal systems and some road crossing warning devices.

B. Insulated Joints are to be inspected and maintained according to MWI 705.

C. These joints are manufactured in a variety of designs. The optimal joint should be used based on track tonnage according to this policy.

D. All tracks, which are not in compliance with the criteria described below, will be brought up to standard during the next curve patch or rail laying project or during maintenance when insulated joint is replaced. Exceptions to this policy must be approved by the Chief Engineer

II. PROCEDURE

A. Insulated Joints will be classified as three general types as described below:

1. Premium insulated joints are joints such as Portec Center Liner or LB Foster Kevlar.
2. Standard duty insulated joints are standard bonded insulated joints.
3. Light duty joints are the encapsulated design or fiberglass bars.

B. Insulated joints should be installed as follows:
   1. All tracks 20 MGT and greater – Premium Insulated Joints.
   2. Turnouts and all other tracks – Standard Duty Insulated Joints.

C. Any deviation to these requirements must have written approval from the CFRC Maintenance of Way Manager.

D. The end post of an insulated joint is to be suspended between the ties unless an insulated steel or composite plate is used. Rubber tie plates under the joint are not to be used when installing a new or replacement joint.

E. Bonded insulated joints are not drilled on the ends by the manufacturer. They should be positioned or cut to facilitate welding.

F. Ordering information for commonly used Premium and Standard Insulated Joints is contained in Appendix I. Ordering information for commonly used Encapsulated Insulated Joints is contained in Appendix II.

Prepared by: RMW

Reviewed by: _____
Gerry Woods - CFRC Maintenance of Way Manager

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

Appendix I. Matrix of Bonded Insulated Joints—Standard and Premium

PREMIUM

Rail	Length	Stagger
115RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
122CB	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
132RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
136RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
141RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"

STANDARD

Rail	Length	Stagger
115RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
122CB	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
132RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
136RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"
141RE	20’	13'-4" X 6'-8"
	40’	23'-4" X 16'-8"

* Note – only most common joint configurations shown.

Appendix II. Encapsulated Insulated Joints

ENCAPSULATED

Section	Hole Spacing
115RE	6”x6”x7-3/8”x6”x6”
	6-1/2”x6-1/2”x5-3/8”x6-1/2”x6-1/2”
122CB	6”x6”x7-3/8”x6”x6”
132RE	6”x6”x7-3/8”x6”x6
136RE 141RE	6-1/2”x6-1/2”x5-3/8”x6-1/2”x6-1/2”

* Note – only most common joint configurations shown.

Maintenance of Way

Welding Manual

ISSUED: December 9, 2013
REVISED: June 13, 2014

PURPOSE:	To establish uniform procedures for all welders performing work for the Engineering Department on track appliances, buildings, bridges or other structures using the thermite, oxy-propane, or electric-arc methods of welding.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks and property.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local Environmental Rules and Regulations.

I. DISCUSSION

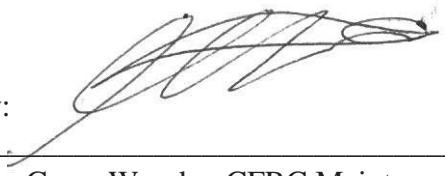
A. The *Welding Manual* is prepared and issued to you for your benefit. It is your duty to study and understand it and perform your work in accordance with these instructions.

B. This manual should always be considered jointly with the other Rules, Regulations, and Instructions affecting the employees of the Engineering Department.

II. PROCEDURE

The *Welding Manual* follows:

Prepared by: RMW

Reviewed by: 

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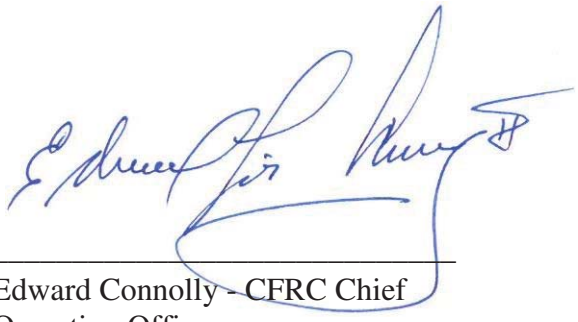
Gerry Woods - CFRC Maintenance of Way Manager

Approved by: 

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Edward Connolly - CFRC Chief Operating Officer

Central Florida Rail Corridor

Welding Manual

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A. SAFETY

GENERAL

1. Safety is of the first importance in the discharge of duty.

2. The title Welder, as used in this Manual, is intended to include Welding Forman, Welder, Welder Helper, and those individuals specifically qualified by the Chief Engineer to operate a burning torch.

3. The Welder is responsible for compliance with this *Welding Manual*, and all other CFRC policies. If the meaning of a rule or policy is uncertain or any conflicts between rules or policies exist, it must be brought to the attention of the Chief Engineer for explanation and resolution.

4. Job Briefings that cover welding, cutting, and grinding activities must include a fire prevention and response plan. Before stepping off the ballast line, check area for plants that may cause an allergic reaction and have insect spray applied.

5. Welding, cutting, and grinding will be done only by or under the direct supervision of a qualified employee. There are several categories of welding used by the Engineering Department. Employees must not do or supervise work in any category that the Chief Engineer has not qualified them for.

6. Protective clothing, shoes, and gloves, which will give the full body protection, must be worn during all welding, cutting, and grinding operations.

    a. Aluminum leggings must be worn for surface grinding with plate mounted or cup wheels. When combination leggings (welding leggings) are available, they may be used for all grinding, sawing, and torch cutting procedures. Aluminum or leather leggings must be used for other grinding work.
    b. Clothing must be kept free of grease, oil, and other flammable materials. When performing these operations, employees must keep shirt sleeves rolled down and collar fastened. Caution must be exercised at all times to keep sparks or slag from being caught in cuffs, pockets, sleeves, under gloves, and out of shoes, eyes, and ears. Frayed clothing must never be worn. Synthetic fabrics that are readily combustible must never be worn.
    c. Welding gloves must be worn during any welding or grinding procedure.

7. Safety glasses must be worn at all times. Employees observing, working near, or performing any grinding, welding, or cutting operations must wear necessary approved face shields, helmets, goggles with approved lenses, and cover glasses.

8. When possible, welding and/or cutting should not be done near combustible material. Either the work or the combustible material should be moved to a safe place.

9. The use of cutting or welding equipment to perform maintenance work on or in a structure without authorization by or without the knowledge of the person in charge of the structure is prohibited.

10. When welding or cutting close to wooden beams, partitions, flooring, or scaffolding, a guard of sheet metal or other non-combustible material should be used. Fire resistant guard curtains (not tarpaulins) should be large enough, tight, and weighted down to prevent sparks rolling underneath or through openings. Every precaution must be taken to provide suitable protection against flying sparks. Before work is started, all surfaces in the area should be carefully cleaned of any readily ignitable material, and combustible surfaces, such as floors, partitions, etc., should be wetted down before the operation is started, and constantly wetted while the work is going on.

11. An employee should be assigned as a "fire watch" to extinguish fires started by sparks, molten metal, or hot slag. A careful inspection of the area, where hot work has been performed, must be made before leaving the work area to detect and extinguish any live sparks or smoldering fires.

12. Suitable fire extinguishers, readily accessible, in ample numbers in close proximity of where the equipment is being used, to provide a quick response. Before beginning grinding, if a water hose is provided, off track area must be dampened with plain water and have hose at the ready for possible pop up fires. Beware of smoke and avoid being in line of smoke so as not to breathe it in. If available on the welding truck in use, the 12 volt pump sprayer must be kept in good working order. If the 12 volt pump sprayer is not available, the 5 gallon Indian pump water sprayer is the best substitute. Always spray from the ballast line when possible.

13. The use of cutting and/or welding equipment, in the performance of maintenance work in structures containing combustible materials, should be avoided. Where the use of welding or cutting equipment is permitted in these facilities, every precaution must be taken to minimize the risk of fire. The Roadmaster will be contacted to assign someone to patrol the area for several hours after the hot work ceases as a "fire watch."

14. Welding equipment must be positioned so that flames and sparks do not fall on cylinders, hoses, electric welding cables, hydraulic hoses, and other equipment.

15. Welders working on bridges, scaffolds, platforms, and other such work areas higher than the surrounding ground will comply with FRA and other governmental regulations in the use of lifelines, safety belts, or other safeguards as protection against falling.

16. Welding or cutting must not be done from any platform suspended by rope subject to burning or damage by fire.

17. Welding or cutting in "confined spaces" may only be performed by employees qualified to enter confined spaces.

a. Welding or cutting in a closed or confined space rapidly burns up breathable oxygen. Adequate ventilation must be provided when working in closed or confined spaces. Equipment must be tested for leaks prior to entering confined area. A person must be in position to see the Welder and near welding equipment to turn it off in case of emergency. Oxygen, propane, or other fuel tanks must not be taken into a confined space.
b. When the welder must enter a confined space through a small opening such as a manhole, a lifeline and safety belt are required. The welder is to adjust the lifeline and safety belt in such a manner that will allow the welder to be pulled from the confined area without having the welder's body jam in the opening.
c. One cannot enter a confined space without a trained rescue team. A life line and safety belt alone is not a suitable extraction plan.

18. Adequate ventilation must be provided when welding or cutting certain metals or using certain welding rods or fluxes as toxic fumes may be produced. Among the metals or items that may produce toxic fumes are beryllium, brass, bronze, cadmium, chromium, fluxes containing fluorides, galvanized iron, lead, lead based paint, manganese, mercury, and zinc. It is mandatory when welding or grinding on manganese to use a power blower. If electricity is available, a power blower is recommended for any welding or grinding operation. If adequate ventilation cannot be provided, a suitable metal fume or HEPA filter respirator must be used.

19. When necessary to obstruct the track(s), the welder must first **know** that full protection is provided in accordance with Operating Rules.

20. The Welder is to report equipment defects or safety hazards to their Roadmaster. The equipment should not be used until it has been checked for safety. Only qualified personnel will make repairs to welding equipment.

21. Hands, whether gloved or otherwise, must not be used to brush slag or metal from material being welded or cut.

OXY-PROPANE WELDING AND CUTTING

1. Refer to propane as “propane” not “gas”. The word “gas” is a general term and confusion is dangerous.

2. Welding and cutting equipment must be kept clean, free of oil and grease, and in good condition. This equipment will be equipped with flash back arrestors and reverse flow check valves to ensure that the gasses mix at the torch. Exception: If using a Victor HD310C torch handle, add on reverse flow check valves must **not** be used, as they are built in this torch handle.

3. Daily inspection must be made on all equipment. Leaky cylinders, hoses, or connections must not be used. Any odor must be traced and all precautions taken against sparks.

4. The use of SNOOP is the preferred method and the only approved liquid for locating leaks. Where SNOOP is not available the following pressure loss method may be used to detect leaks:

    a. Connect equipment.
    b. Open cylinder valves, set pressures, and purge hoses.
    c. Close torch and cylinder valves.
    d. Watch gauges for approximately one minute.
    e. If the pressure indicated by the gauges remains the same, there are no leaks.
    f. If the gauge indicating tank pressure shows a drop, there is a leak between the cylinder and the regulator.
    g. If the gauge indicating hose pressure shows a drop, there is a leak between the torch and the regulator.
    h. If a leak is indicated, check the fittings and hose in the appropriate area.

5. Keep oil and grease away from cylinders, cylinder valves, and hoses. Grease and oxygen is a highly explosive mixture.

6. Open cylinder valves slowly.

7. Purge oxygen and propane lines and hoses before lighting the torch.

8. Cylinders must not be roughly handled and must never be handled with a magnet. Cylinders must be transported, stored, and used in a vertical position. A special cradle can be used to ensure proper cylinder positioning.

9. Never use a cylinder or its contents for other than their intended purpose.

10. Protect cylinder valves from bumps, falls, falling objects, heat, and the weather. Use cylinder safety caps when moving any cylinder.

11. It is a CFRC, OSHA, and DOT requirement that all compressed gas cylinders **MUST** have safety caps protecting the valves when they are transported over public roadways. The APPROVED protector cylinder valve caps will fulfill this requirement and the regulators may be left on the cylinders. Some state and local laws may vary so always follow the most restrictive laws. If the protective valve caps are not available, the solid safety cap must to be used. Propane cylinders must have a screw-in safety plug in the valve outlet when being transported unless the solid safety cap design does not provide adequate room to accommodate the safety plug.

Description
Protector Cylinder Valve Cap – Oxygen
Protector Cylinder Valve Cap – Propane
Safety Plug – Propane

12. Before moving the cylinders, purge the hoses by closing the cylinder valves, opening the torch valves to release pressure on the gauges, and release the regulator valve screw.

13. **Gauges must be removed from the cylinder at the end of <u>every</u> work day.**

14. Mark empty cylinders 'empty' or 'M.T.' with a removable material, such as chalk or crayon. Do not place marking on top of numbers stamped into or stenciled onto cylinders.

15. Send empty cylinders back to supplier promptly. Never attempt to refill any cylinders.

16. Storage of cylinders.

    a. Cylinders shall be kept away from radiators and other sources of heat.
    b. Inside of buildings, cylinders shall be stored in a well protected, well ventilated, dry location, at least 20 feet from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage places shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.
    c. Inside a building, cylinders except those in actual use or attached ready for use shall be limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.
    d. Oxygen cylinders in **storage** shall be separated from propane cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire resistance rating of at least one-half hour.
    e. In vehicles, if the cylinders are kept in a locker or cabinet, the locker or cabinet must be ventilated. Openings both top and bottom must be provided or the locker or cabinet fitted with a louvered door that will permit any oxygen or propane leaking from a cylinder to disperse freely.

17. Keep valves closed on empty cylinders.

18. Use only approved wrenches for opening cylinder valves not equipped with handles.

19. Never use oxygen for any purpose other than welding. Oxygen is not a substitute for compressed air and should never be used to blow off clothing.

20. Cylinders must be fitted with twin Grade "T" hoses for propane and oxygen with an inside diameter of ¼" or 3/8". Hoses with an

inside diameter of 3/8" must be used to preheat the rail ends when making field welds with a length not to exceed 100'.

21. Flashback arrestors and reverse flow check valves

    a. Hoses for propane and oxygen will be fitted with combination flashback arrestors and reverse flow check valves at the regulator end.

    b. Hoses for propane and oxygen will be fitted with reverse flow check valves at the torch end, unless using a Victor HD310C torch handle. Note that the placement of additional external reverse flow check valves on the Victor HD310C torch handle can cause fuel starvation and a possible blowout of the mixer assembly.

    c. Flashback arrestors and reverse flow check valves must be inspected in accordance with manufacturer's instructions at least every six months unless required more often by the manufacturer.
        i. In the absence of manufacturer's instructions for testing flashback arrestors and reverse flow check vales, the following procedure must be followed.
        ii. Turn off both regulator adjusting valves. Remove the reverse flow valves from the torch and the flashback arrestors from the regulators.
        iii. Attach the reverse flow valves onto the regulators. Pay particular attention to attach the oxygen valve to the oxygen regulator and the propane valve to the propane regulator.
        iv. Turn on each cylinder with the "T" handle until the pressure reaches 65 psi for oxygen and 15 psi for propane. If either valve allows their respective gases to flow, the valves are defective and must be immediately replaced before proceeding.
        v. Remove the reverse flow valves from the regulators and attach only the hoses to the regulators.
        vi. Attach the flashback arrestor to the torch end of the hose (with the torch not attached). Pay particular attention to attach the oxygen flashback arrestor to the oxygen hose and the fuel gas flashback arrestor to the fuel gas hose.
        vii. Turn on each cylinder with the "T" handle until the pressure reaches 65 psi for oxygen and 15 psi for propane. If either flashback arrestor allows their respective gases to flow the flashback arrestor is defective and must be immediately replaced before proceeding.

    d. Victor HD310C torch handles will be checked for reverse flow using the following procedure.

        i. Turn off both regulator adjusting valves.
        ii. Disconnect one hose from one of the regulators.
        iii. Open all torch control valves.

iv. Plug the tip end.
v. Turn on the regulator that is NOT DISCONNECTED until a 2 to 5 psi reading appears.
vi. Put the end of the hose that is DISCONNECTED from the regulator under water or cover the end of the hose with an approved leak detector solution such as SNOOP.
vii. Bubbles will appear if the check valve is leaking. There should be no more than two bubbles in 10 seconds.
viii. If the check valve leaks, reconnect the hose to the regulator and unplug the cutting tip. Flush for 3 to 5 seconds with 10 psi of propane or 30 psi of oxygen (depending on the valve being tested).
ix. Retest the check valve using steps i. thru vii. above. If there is still a leak, replace or repair the torch before proceeding.
x. Reconnect the hose that was disconnected for the first test. Repeat steps i. through ix. with the other hose.
xi. After both check valves test good, purge both the oxygen and propane lines before lighting the torch. Test all hose connections for leaks.

22. Quick disconnect hose couplings are **not** to be used.

23. Repair hoses and connections **only** with crimp style welding hose repair kit and perform Snoop test prior to use.

    a. Never attempt to repair hoses with friction tape, or other types of tape or with wire.
    b. Do not use Teflon tape or pipe dope on any of the system's compression fittings. (eg. Regulator to cylinder valve, flashback arrestors, reverse flow check valves, test gauges, hose connections, etc.)

24. Before cutting through sheet metal, plate, or other material, employees must be certain that no persons are in a position to be burned or injured from falling material.

25. Do not use wooden or flammable material to support work for welding and cutting.

26. Only approved vendors will perform other than routine adjustments and maintenance to regulators.

ELECTRIC ARC WELDING

Mandatory use of wire feeder.
Any welding repair to frogs, switch points, engine burns, rail ends, etc. that require more than a 30 minute repair (minor repair) will be done with a wire feeder,
All welding teams, other than a dedicated thermite Welding Team, that have a wire feeder are required to use it. If a team does not have a wire feeder, or it is broke down, the Chief Engineer for that area is to be contacted and he will handle accordingly.
This instruction applies to sections:

C. Repair of Engine Burns

D. Repair of Rail Ends
E. Repair of Rail Ends for Glued Bonded Insulated Joints
F. Repair of Switch Points
G. Repair of Frogs and Railroad Crossings

1. Avoidance of electric shock is largely within the control of the Welder. Most welding voltages are not high enough to cause severe injury by electric shock; however, a mild shock from normal working voltages may cause involuntary muscular action that might cause a person to lose balance. Wet clothing reduces the resistance of cloth and increases the effect of a normally small shock. Notwithstanding, under certain conditions, the voltages produced by an electric welder can be dangerous to one's life.

2. Live metal parts of an electrode holder must not be allowed to touch bare skin or wet clothing.

3. An electrode holder must not be permitted to touch any metal that contacts the welding ground. This will cause a dead short circuit on the welding generator resulting in damage to the equipment.

4. The jaws of the electrode holder must be kept clean.

5. Welding Cables:

    a. Cable capacity must be matched to the welding machine.
    b. The standard length of cables connected to the welding machine is 50 feet. Shorter or longer lengths may be used with permission of the Chief Engineer.
    c. On territories where track access is limited by terrain, an additional 50 feet of cable may be added using insulated cable connectors.

6. Always be sure that the cables are in good condition and all cable connections are tight.

7. Cable splices must be 10 feet or greater from the electrode holder.

8. Cable is to be uncoiled before welding. It should be strung out on the ground without crossing itself. Do not leave cable coiled up and hanging from a hook or coiled up one layer upon another while welding.

9. Do not coil or loop electrode cable around the body while welding.

10. All ground connections must be mechanically strong, close to the work, and of adequate size electrically. Never attach ground clamp to the rail base. Use of a magnetic ground clamp that attaches to the ball of the rail is recommended. (Item # 280.0859924.1)

11. Never operate a gasoline or diesel powered welder in a confined space or without adequate ventilation.

12. Never strike an arc on, or touch an electrode against oxygen, propane, or other cylinders used for the storage of compressed gas.

13. Electrodes must be removed from holders when not in use. Electrode stubs should be disposed of into a metal container.

14. Other than routine maintenance, only qualified individuals or vendors will make repairs to welding machines.

15. Where practical, the work should be enclosed with a fire proof screen to protect the eyes of others from the glare of welding rays. Welders working along the line of road must take precautions to protect the public and others employees not involved in the welding process from glare.

16. When the use of a wire feeder is complete, both the 15 feet welding gun and the roll of wire must be removed from the feeder.

ELECTRIC ARC WELDING IN TRACK CIRCUIT TERRITORY

1. High amperage current (100 to 300 amperes) used for welder operation, which flows through a section of rail during the arc welding process, has a tendency to leak to earth and unbalance the track circuit.

2. Stray electrical current could damage sensitive signal equipment that is used for train operation and active grade crossing warning devices.

3. Unbalancing of the track circuit may affect the operation of track relays resulting in signal interruptions.

4. Sufficient stray current could flow through the track relay to hold it energized with the track circuit occupied if the return current of the welding outfit is allowed to flow through only a short section of rail.

5. Operation of the electric arc welder on bridge guard rails, or on non-bonded tracks, such as sidings or non-signaled running tracks, running parallel to or in close proximity to main tracks equipped with track circuits, will also affect the proper operation of the track circuit. The following instructions must be followed when using electric arc welding equipment on any track or guard rail in track circuited territory.

6. Before proceeding with the use of an electric welder on tracks in track circuited territory, the Signal Maintainer must be notified a sufficient time in advance to install circuit fuses to protect signal equipment.

7. The location of insulated joints must be ascertained before any work is undertaken. If there is a question as to the limits of any track circuit, a signal employee must identify the limits

prior to the start of work.

8. Electric arc welders (generators) must be properly insulated, and insulation kept in good condition.

    a. All electrical equipment must be grounded at the source, and all connections must be clean and tight.
    b. The ground clamp must be clean, fit well, and make full contact without any current resistance. Use of a magnetic ground clamp is recommended.

9. Do not disturb the ground clamp while welding. Welders equipped with mechanical ground bars must not be moved during welding, nor stopped with the ground spanning an insulated joint.

10. Care must be exercised to see that the ground plates are never allowed to touch the opposite rail of the track on which welding is performed as this will cause serious damage to signal apparatus.

11. The welding electrode and ground plates must never be dropped in the ballast or be permitted to come in contact with the ground while the generator is running. When the welder is not in operation, they should be carefully laid on the end of a tie.

12. At points where the wires are run under or over the rails of any track, additional protection of the insulation must be provided by sliding a short section of rubber hose or placing an insulating mat between the wire and rail.

13. When performing electric arc welding operations on or about bridge structures, the use of guard rails or bridge members for completing the "Hot" side of the circuit between generator and welding electrode must be avoided. An insulated cable conductor must be used for this purpose. When welding guard rails or bridge members, extreme care must be taken to prevent tools, tie plates, or other metallic objects from making contact between main track rails and the member on which welding is performed.

14. Equipment such as grinders, slotters, push cars, and hi-rail vehicles must be properly insulated to prevent shorting the track circuit.

15. In track circuit territory, multiple operator welding systems where two or more welding circuits are connected electrically to the same source must not be operated.

16. No more than two single arc-welding machines may be operated within the limits of any track circuit. This applies to territory having one or multiple tracks.

17. Automatic and semi-automatic wire feed systems must be fully insulated from the unit frame.

18. For the welding of conventional insulated joints, standard joint bars shall be applied on only one joint at a time. (When the insulated joint is on the closure rail, the installation of

standard joint bars may short the track circuit.)

19. Protect bond wires during preheating, post heating, welding heat, surface grinding, and cross slotting.

20. The polarity switch must be in the "OFF" position while traveling or when removing the welding machine from the track. Some welding machines do not have a polarity switch with an "OFF" position. These welding units must be turned off while traveling or when removing the machine from the track.

THERMITE WELDING

1. Daily inspection must be made of all equipment to ensure that the equipment is kept clean and in good condition.

2. All equipment and personnel, not directly involved in making the weld, will be moved to a safe distance of 20 feet (30 feet if snow on the track) during the weld reaction and pour, as well as during the grinding operations. In particular, equipment will be far enough from the work to ensure that it is not showered with sparks from these operations.

3. The slag basin shall have 3/4" of dry sand placed in the bottom of the basin during the preheat process.

4. At any time the ballast or surface under a field weld is wet, a safety pan will be placed directly under the weld. The safety pan is a metal container approximately 8" x 18" x 6" with 3" of dry sand in the bottom as illustrated in Sketch A-1.

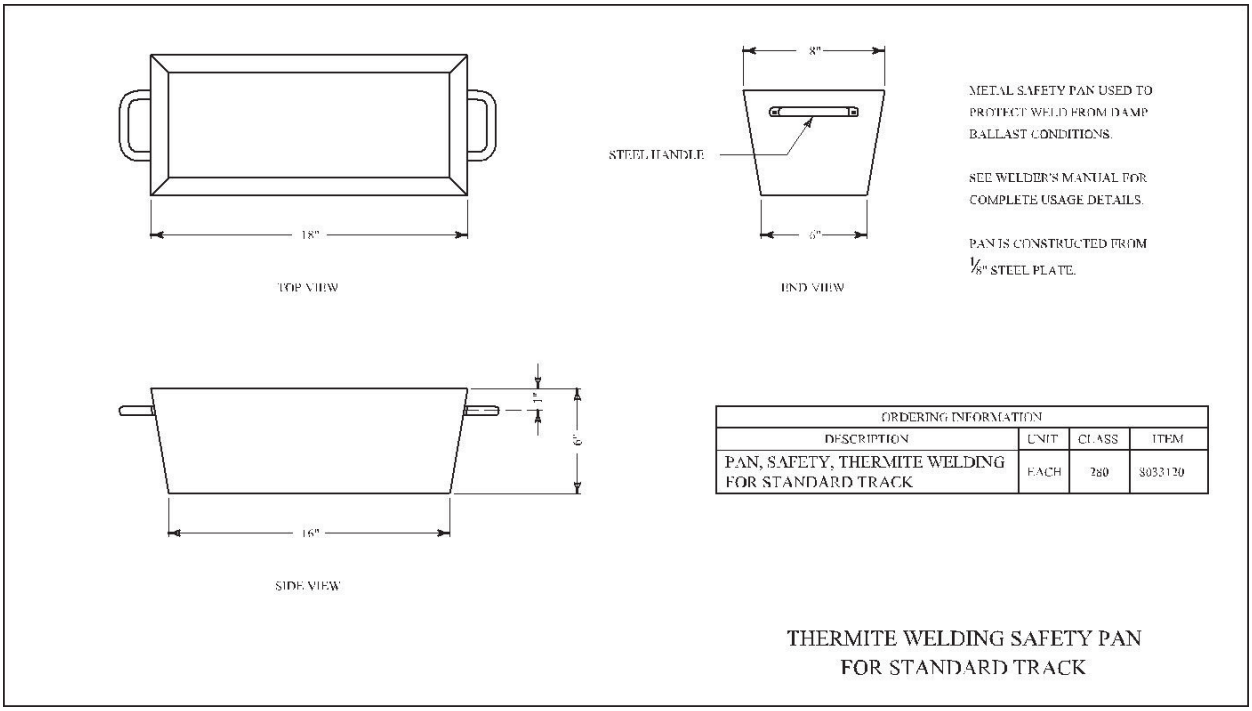
5. When a weld must be made on an open deck bridge: A safety pan will be placed directly under the weld. The safety pan is a metal container approximately 10" x 26" x 6" with 3" of dry sand in the bottom as illustrated in Sketch A-2.

6. A full face shield, welding gloves and long sleeves are required when handling hot slag basins and during the tear down process of a poured weld. This face shield and welding gloves are required during the shearing process.

7. Do not move the slag basins until five minutes (six minutes for wide gap welds) have passed since the pour. After five minutes, move the slag basin fifteen to twenty feet (eight to ten ties) and place on level ballast. After twenty additional minutes have passed, empty slag basin in designated location.

8. Never throw hot metal or slag into water, snow, or ice because an explosion may occur.

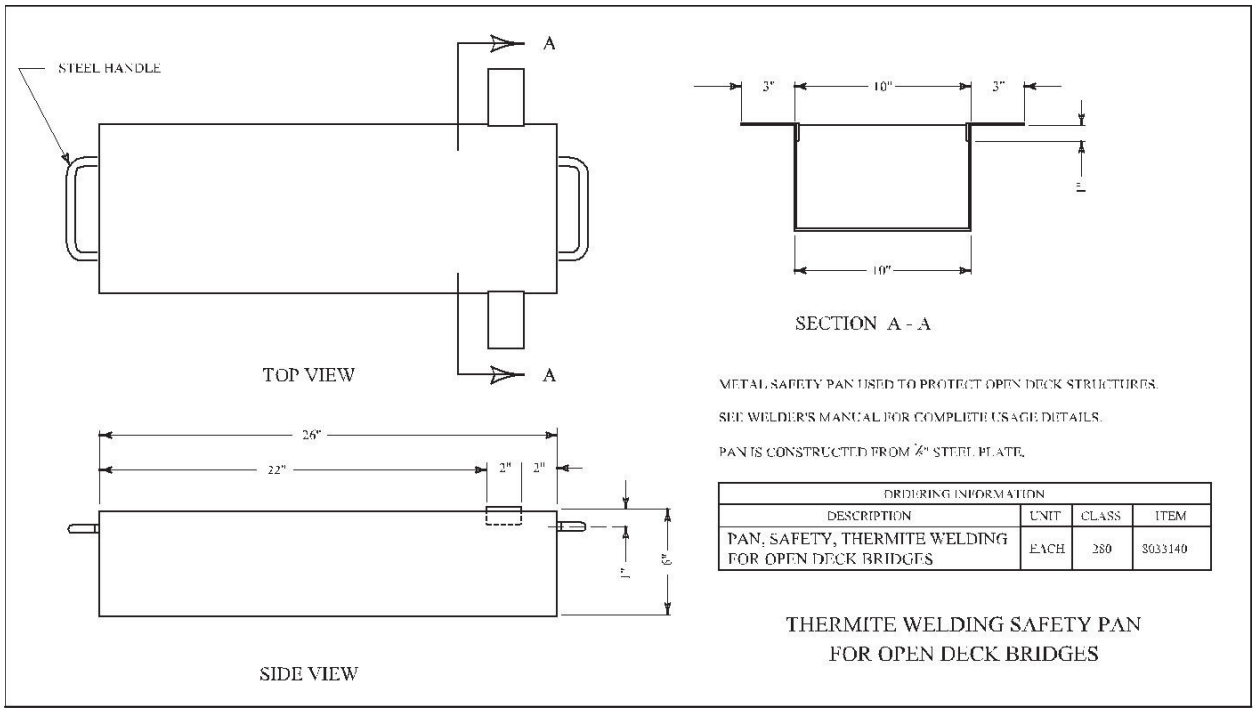
9. The contents in the slag basin(s) and safety pans should be dumped only after they have completely solidified, and in a dry place where it will not cause a fire or personal injury.



Sketch A-1

10. One method for removing weld risers is the weld riser removal tool. Insert the tool vertically with the large opening over the riser and the notch toward the weld. Pull the end of the tool smoothly to the desired angle in accordance with the welding procedure. When breaking of a riser, completely insert the tool onto the riser and use the tool defensively due to the snapping effect. After breaking off a riser, the riser may be handled with the tool and placed in the disposal area.

11. If using a hammer to remove the weld risers, a full face shield and welding leggings must be worn. Always stand on the opposite side of the rail from the riser that is being struck. A hot cut chisel can be used to gently remove the sand mold from around the base of the risers to allow for cooling. The risers should not be removed until approximately 25 minutes after the end of the pour. Be sure to clear the “red zone” before striking the risers and use only light taps with the hammer.



Sketch A-2

HAND TOOLS

Using Hot Cut Chisel:

1. Hot cut chisel may be used for clean up of sand mold debris around base risers and side of weld areas, but will not be struck doing this clean up task. Employee must stand on opposite side of rail to be cleaned and with light downward strokes, remove sand away from risers. When done cleaning on first side, step over the rail to clean other side of rail. All required PPE is stated below.

2. In case of emergency, such as weld shear failure, the hot cut chisel will be used to cut risers from side of ball and clean up top of ball after torching off head. This will be done only after the hot cut chisel has been inspected as explained below.

3. Hot cut chisel handle will be inspected for cracks, the chip protector will be removed, and head of hot cut chisel will be inspected for cracks, overflow, or missing pieces.

4. The tool will be ground if not found in compliance and if pieces are missing, the hot cut chisel will be removed from service.

5. After the head of the hot cut chisel has been inspected and corrected, the chip protector will be put back in place.

6. The cutting edge of the hot cut chisel is to be properly sharpened using the procedure outlined in MWI 1702.

   Chip Protector – 3 lbs. Hot Cut Chisel
   Chip Protector – 5 lbs. Hot Cut Chisel

Note: When using a hot cut chisel to cut away excess metal from the sides of the railhead, the following procedure must be followed:

1. Head of the hot cut chisel must be turned to a perpendicular angle between 10 to 15 degrees away from vertical in relation to the ball of rail. See photo A-1.
2. Cutting point of chisel must not strike risers squarely rather at an angle. See photo A-2.
3. Head of chisel must be hit squarely. See photo A-3.
4. Chip protector is correctly sized. See photo A-4.

Photo A-1

Photo A-2

Photo A-3

Photo A-4

Required PPE:

If the hot cut chisel does have to be used due to weld shear failure, the following PPE will be worn by both holder and striker:

- Hardhat,
- Safety Glasses,
- Face Shield with chin guard,
- Welder's Gloves and,
- Leather/Metal Metatarsal Leggings

1. Handles must be maintained tight on all hammers, sledges, mauls, chisels, etc.

2. Ensure everyone is standing clear of the red zone before swinging any wide arching sledge or maul.

3. All burrs, chips, and battered metal must be ground off all hand hammer driven tools, such as sledges, spike mauls, hot cut chisels, wedges, drift pins, etc.
   The use of a dead blow hammer is required when striking alignment wedges to crown rail ends for welding.

4. When striking and struck tools are repaired, they must be ground to an approved contour, checked with an approved template and fitted with a chip protector. See MWI 1702 for more information on repairing hand tools.

CUTTING RAIL AND TRACK BOLTS AT DERAILMENT SITES

1. Do not use welding or cutting equipment at the scene of a derailment until the person in charge of re-railing operations advises that it is safe to do so. Material leaking from damaged cars may be explosive or highly flammable and the use of open flames must be controlled.

2. Twisted and bent rails may shift to a new position with little or no warning when cut. Before making the cut, all personnel not involved in making the cut shall be clear of the Red Zone. Use heavy equipment to stabilize the rail before cutting and during the entire cut. The torch must be at least 36 inches or longer. The welder must be positioned in order to not become caught between the rail and other objects if the rail does shift.

3. Joint bars on twisted and bent rails may be propelled a considerable distance when the bolts are cut. A chain loosely wrapped several times around the joint will restrain the joint bars when the bolts are cut. If the bolts are under pressure, they may also fly when cut. If in doubt, cut the rail first and then remove the joint bars.