Technical Requirements

Track Renewal & Grade Crossing Upgrade Project

For the
Central Florida Rail Corridor

Florida Department of Transportation

District 5

c. Upset Current: Must be a minimum of one second in duration.

d. Upset Blow: Upset to refusal within 5/8" is standard. Minimum upset required is ½". When using puller, holding pressure until the weld has cooled to 700^{o}F or less (approximately seven (7) minutes after upset) is mandatory for closure welds. No clamp slippage is allowed.

e. Weld Rejection: Welds rejected will be cut down through the middle of the weld with a rail saw or, if torch cut, re-weld within 30 minutes.

3. Welding Machine Setup

The following procedure is to be used in the preparation of the welding machine for welding a specific rail section.

a. Upsetting pressure will be adjusted to the proper setting for the rail section and metallurgy being welded.

b. Flashing time will be lengthened or shortened until the standard 5/8 inch upset is achieved.

4. Upsetting Pressure for any Rail Section

The minimum upset pressure is 40 metric tons or 44.1 US tons.

5. Chart Recorder

A chart recorder approved by CFRC is to be used to monitor welding current, platen displacement and hydraulic pressure.

6. Weld Finishing Requirements

a. All notches resulting from offsetting and shearing operations will be eliminated by grinding.

b. A finishing deviation of 0.015" will not be exceeded on the rail running surface.

c. A finishing deviation of 0.010" will not be exceeded on the gage and field sides of the rail head.

d. The web zone (underside of rail head, web, and top of base) will be finished to within 1/8" of parent metal but not deeper than parent section. Care must be exercised to insure that finished grinding on the underside of the rail head and head to web fillets

removes all sharp notches and leaves a smooth transition zone.

7. Weld Inspection

    a. The electrode contact area will be visually inspected for electrode burns. Electrode burns may appear as small deposits of copper electrode on the rail or there may be evidence of metal flow of the parent rail steel.

    b. After finished grinding, a visual inspection is required.

    c. When the external stripper or shear is used for removing the upset, the clamp area in the web will be inspected on every weld for gouges or slippage. Any excessive gouge in the parent metal will be rejected.

    d. Any weld not meeting the specified tolerances and tests will be cut out and re-welded.

8. Weld Tolerance Measurement

    a. Tools: A 36" straightedge and a taper gauge will be used to take measurements from the finished weld.

    b. Procedure: Center the 36" straightedge over the weld against the high side. Gently slip the taper gauge under the extreme end of the straightedge lengthwise, reading the amount of variation from the taper gauge for offset and crown camber measurements.

    c. The following tolerances were developed, assuming that like class rail is being welded; i.e. New to New, Class 1 to Class 1, etc.

9. Weld Tolerance Offset Limits for New, Class 1, 2 and 3 Relay Rail.

    a. Rail Height Mismatch:

    Maximum Height Differential 0.250"

    b. Rail Head:

Vertical offset:	0.125"
Gage side horizontal offset:	0.050"
Horizontal kink:	0.025"

    c. Rail Base:

Vertical offset:	0.125"
Horizontal offset:	0.100"

10. Surface Misalignment after Grinding:
    Combined offset and crown camber: 0.015”
    Combined offset and dip camber: 0.000”

11. Gage Misalignment after Grinding:
    Combined offset and kink: 0.020”

REPAIR WELDING PROCEDURE

This procedure is designed to produce a quality rail weld and adjust the rail at the same time. It is based on 1 ½” rail consumption per weld. In this procedure the following terms have been adopted to avoid confusion:

- Defect Plug - The piece of rail to be removed from the track. The normal length of a defect plug is 19’-0”. This length has been selected to balance the physical characteristics of the various In-Track Welding Equipment and track surface and alignment requirements. When using CFRC Plasser In-track welder, minimum plug length must be 27 ft.

- Replacement Plug - The piece of rail to be installed into the track. The normal replacement plug length is 19’-1-1/2” This length is determined by adding 1-1/2” to the length of the defect plug.

- Current Rail Temperature - The rail temperature measured at the work site.

- Adjusted Rail Temperature - The desired rail laying temperature. It is location dependent and is specified in MWI 1125.

- Temperature Measuring Device - The In-Track Welding Team is normally equipped with a Fluke Digital Model 51 thermometer with a model 80PK-7, Industrial Surface Probe. It read instantly and temperature measurements can be made quickly.

- Match Marks - Marks precisely measured and placed on tie plate and base of the existing rail that will remain in track after the defect plug is removed. They are normally 25’ apart and are used for quality control purposes in this procedure.

- Plug Weld - The first weld made with the replacement plug, both ends are free.

- Closure Weld - The second weld made with the replacement plug, one end free. This weld restores the track’s integrity.

- Closure Weld Release Temperature - The maximum temperature (700^{o} F) at which the puller can be released without damaging a closure weld.

1. Mark the cut marks for the length of the Defect Plug on the top of the existing rail. The marks should be approximately centered in cribs to expedite the welding process. The normal length of a defect plug is 19'-0".

2. Make Match Marks on the top of the existing rail exactly 25' apart. The witness marks should be approximately centered around the defect plug cut marks. Enter the measurement on the *Record of In-Track Welding* form.

3. Measure the Current Rail Temperature with the digital thermometer. Enter the measurement on the *Record of In-Track Welding* form.

4. Identify the proper Adjusted Rail Temperature from MWI 1125. Enter the temperature on the *Record of In-Track Welding* form.

5. Determine the Temperature Difference by subtracting the from the Adjusted Rail Temperature and enter on the *Record of In-Track Welding* form.

6. Find the value in Temperature Difference column of the *Repair Welding - Table 1* (column A). Read the Free Rail Length (in feet) from column B, the 10^{o} F Variation from column C, and the Nominal Closure Force from the proper column (column D-I) of *Repair Welding - Table 1*. Enter the values on the *Record of In-Track Welding* form.

7. Remove rail anchors and loosen any tight spikes for the Free Rail Length determined above. Ideally the Defect Plug should be in the center of the freed rail. However when installing plugs near fixed objects, such as bridges, turnouts, road crossings, railroad crossings, etc., the length of freed rail can be moved to location that encompasses the Defect Plug. If possible, there should be at least 234' between the fixed object and the beginning of the freed rail.

8. The length of free rail must be examined for anything that would cause the rail to bind or restrict the movement of the rail in the direction of the weld. The weld process cannot be initiated until the closest point between the possible obstruction and the adjacent tie/tie plate in the direction of the pull is 2" or greater. Reposition ties as necessary.

9. Polish the webs of the existing rails for electrical contact. Polish both sides of the webs for a distance of 27" from the weld location. Remove any branding in this area.

10. At the completion of the initial saw cut a gap of 1 ½" should open in the rail.

11. If a gap of at least 1 ½" did not open, the free rail should be vibrated to break the friction bond between the rail and the tie plates.

12. The Team Supervisor evaluate the following conditions and determine the proper course of action:

    a) A 1 ½" gap was obtained, continue with step #13.
    b) A gap less than 1 ½" was obtained, go to step # 24.
    c) A gap more than 1 ½" was obtained, go to step # 25.

13. Make the second cut to free the Defect Plug.

14. The preparation team moves to next location and the welding team moves into place. The In-Track Welder moves over the Defect Plug, beyond both weld locations.

15. The existing rail at the closure weld location is barred out of the tie plates to the field side. The Defect Plug is removed.

16. Place the Replacement Plug in the rail seats of the tie plates. Re-spike the center portion of the Replacement Plug to aid in weld alignment.

17. Align the rail ends nearest the In-Track Welder and complete the Plug Weld. During the upsetting of this weld the rail ends at the Closure Weld location will pass each other. Return the existing rail to the tie plate seats.

18. While the Plug Weld is cooling to the required Closure Weld Release Temperature, profile grind the Plug Weld, place and clamp the puller at the Closure Weld location.

19. After the Plug Weld has cooled below the Closure Weld Release Temperature, pull closed any gap. Release the puller and measure the gap. Pull the gap closed and read the puller force. Enter the reading on the *Record of In-Track Welding* form.

20. Check puller force required to close the gap, determine in step #19 above, against the *Rail Gap vs Puller Force Limitation* chart for the puller you are using. Using this chart, determine if the puller has adequate capacity to complete the weld. Enter the OK/No on the *Record of In-Track Welding* form. If no, the closure weld can not be made.

21. Align the rail ends and complete the Closure Weld. At the completion of the Closure Weld, record the puller force on the *Record of In-Track Welding* form.

22. While the weld is cooling to the Closure Weld Release Temperature, re-spike and re-anchor the track. Begin at the Replacement Plug location and work away from it.

23. After the weld has cooled below the Closure Weld Release Temperature, release the puller, move the In-Track Welder to next location and profile grind the weld. Go to step #26.

24. If the gap is **less than 1 ½"**, then the temperature difference and the free rail length are not correct.

    a) Re-measure the Current Rail Temperature and compare to the initial Current Rail Temperature measurement. If the Current Rail Temperature has increased, go to step #5.

    b) If the Current Rail Temperature has not changed, then the Adjusted Rail Temperature has fallen below the standard. If the Current Rail Temperature has decreased, then the temperature difference is not correct. In either case additional rail will need to be removed from the track. Relocate the remaining Defect Plug cut mark on the existing rail to a point that will provide 1 ½" overlap between the existing rail and the Replacement Plug. Go to step #13.

25. If the gap is **greater than 1 ½",** then the temperature difference and the free rail length are not correct.

    a) Re-measure the Current Rail Temperature and compare to the initial Current Rail Temperature measurement. If the Current Rail Temperature has decreased, go to step #13.

    b) If the Current Rail Temperature has not changed, then the Adjusted Rail Temperature has risen above the standard. If the Current Rail Temperature has increased, then the temperature difference is not correct. In either case additional rail will need to be added to the track. Relocate the remaining Defect Plug cut mark on the existing rail to a point that will provide 1 ½" overlap between the existing rail and the Replacement Plug. Go to step #13.

26. Measure the distance between the Match Marks. Record the final distance between the Witness Marks on the *Record of In-Track Welding* form. Determine the amount of rail added/removed during the welding process.

27. Compare the puller tonnage recorded in step #21 with the Nominal Closure Force. If the puller force exceeds the Nominal Closure Force by more than 15 tons, it is likely that something prevented free movement of the rail in the direction of the weld. Walk the free rail and look for evidence of longitudinal restraint (bunched ballast, skewed ties, humped etc.) in the track. Repair as necessary.

28. Compare the final and original Match Mark measurements. The difference should be less than the 10^{o} F Variation to ensure that the Actual Adjusted Rail Temperature is within 10^{o} F of the Desired Adjusted Rail Temperature. If it is not, complete a *Track Disturbance Report*.

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N. APPROVED WELDING ELECTRODES AND WIRES

FOR USE WITH MANGANESE FROGS.

Name	*Size*	*Polarity*	*Description*	*Use*
Lincoln Frogmang ED026101 60 Pounds	3/16" Electrode	*DCRP*	Coated 22% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
Lincoln Frogmang ED026106 25 Pounds	1/16" Wire	*DCRP*	Flux core, self shielded 25% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
Lincoln Frogmang ED026105 25 Pounds	5/64" Wire	*DCRP*	Flux core, self shielded 25% manganese alloy.	Build-up and repair of manganese components in frogs and crossings.
Inweld Frog-Spec 60 Pounds	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.
TrackWeld 912 TrackWeld 912 Matweld 900	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.
TrackWeld 570W	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

Name	*Size*	*Polarity*	*Description*	*Use*
Trackweld 540 40 Pounds	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..
Trackweld 540W 30 Pounds 540W - 10 lbs. 540W – 10 lbs.	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
Frogalloy/M122 10 pounds	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
McKay M-932	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
Inweld Railspec-O	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
Inweld Railspec	1/8” 5/32” 3/16” 1/4" Rod	DCRP		Use ¼” only with machines capable of 300+ amps

Other Rods.

Name	*Size*	*Polarity*	*Description*	*Use*
Slice Torch	1/4” x 22” 1/4” x 44”	*DCRP*	Tubular metal rod	For removal of defective material from manganese components
Arc Air Pack of 50 rods	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.
AWS 7018 10 lb packs	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.

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O. WELDING SUPPLIES

Item Number	Description
	ELECTRIC WELDING MATERIALS AND EQUIPMENT
	Cable, welding, number 2/0 AWG, 375 amp, 600 volt, neoprene jacket, Mylar separator.
	Cable, welding, number 3/0 AWG, 450 amp, 600 volt, neoprene jacket, Mylar separator.
	Connector, cable, male. Tweeco 4MPC-1 for 3/0 - 4/0 cable
	Connector, cable, female. Tweeco 4MBP-2 for 3/0 - 4/0 cable
	Connector, cable, ball point with neoprene cover, TWECO 9405-1100, model 1-MPB.
	Clamp, welding, ground, TWECO model TW GC-500.
	Ground Clamp - Magnetic - 600 Amp.
	Holder, Electrode, 400 Amp, 1/4" capacity, Tweco Model A-14HD.
	Holder, Electrode, 500 Amp, 3/8" capacity, Tweco Model A-38HD.
	Block, carbon, box of 4. Use in flangeway to repair frog.
	Brush, wire, metal cleaning, 1" X 13-3/4" curved hardwood handle.
	Gauge, flangeway check, frog and railroad crossing, AREMA Plan 790-55
	Gauge - Frog - use to check POINT of CONFORMAL Heavy Point. Drawing APD 1697
	Gauge - Frog - Use on repair of Conformal Heavy Point Frog. Set of 3 gauges - IRS728
	Gauge - Frog - Use on repair of Boltless Conformal Heavy Point Frog. Set of 2 gauges
	Grinder - W/Guard, 9" - 3 HP - 5000 RPM - 115 V. - 5/8"X11 Spindle.Dewalt
	Grinder - W/Guard, 4-1/2" 8500 RPM - 115 V. - 5/8"X11 Spindle. Dewalt
	Needle Scaler Model 182LNA1 - Ingersol Rand - Requires Comp. Air 100 psi.
	Needles for Scaler - U/M = Set - 19 needles per set
	Helmet - Welding - Lincoln Electric Viking
	Filter - Auto Darkening - Replacement for Lincoln Electric Viking Helmet
	Lens - Cover External - for Lincoln Electric Viking Weld Helmet - Min. Order = 5
	Lens - Cover INTERNAL - for Lincoln Electric Viking Weld Helmet - Min. Order = 5
	Lens - Magnification X 1.25 - for Lincoln Electric Viking Weld Helmet
	Lens - Magnification X 1.50 - for Lincoln Electric Viking Weld Helmet
	Liner - Sweatband - for Lincoln Electric Viking Weld Helmet
	Helmet - Welding - Jackson Truesight - Digital Auto Darkening
	Filter - Auto Darkening - Replacement for Jackson Truesight Helmet.
	Lens - Cover External - for Jackson Truesight Weld Helmet - Min. Order = 10
	Lens - Cover INTERNAL - for Jackson Truesight Weld Helmet - Min. Order = 10
	Speedglas Welding Helmet - complete.
	Replacement batteries for Speedglas welding helmet.
	Speedglas Kit, inner & outer clear shield and batteries.
	Protection plate - inside - clear - for Speedglas Welding Helmet.
	Protection plate - outside - clear - for Speedglas Welding Helmet.
	Copper Plate - 24"L X 2"W X 1/4"T - For Welding Switch Points.
	Copper Plate - 24"L X 2"W X 1/8"T - For Welding Switch Points.
	Hammer - Ball Pein - 32 oz. Grade B Steel W/Fiberglas Handle.
	Hammer - Dead Blow - Vaughn -W / Replaceable Striking Surfaces.

Item Number	Description
	Replaceable Striking Surfaces for Vaughn Dead Blow Hammer - White Need 2 ea.
	Hammer - Slag - Wooden Handle - Vaughn.
	Hammer - Chipping - Vaughn
	Wire Feeder - Lincoln - LN-25 PRO. - Does NOT include Mig Gun.
	Mig Gun - Lincoln - K-126-12 - Fits LN-25 and LN-25 PRO Feeders.
	Liner, Replacement - Mig Gun - Lincoln - K-126-12
	Seat - Track Welders W/3 Adj. legs and back support. Eidos Track Master Model 110
	Seat - Track Welders W/Three way air splitter - fold down back rest. Model BRET17
	Shield - Heat - Fits Lincoln K-126 Mig. Gun.
	Gun Tube (Goose Neck) - Lincoln - 62 degree - Fits K-126 Mig Gun.
	Insulator - Contact Tip - Lincoln - Fits K-126 Mig Gun.
	Contact Tip - Lincoln - 1/16th dia. Fits K-126 Mig Gun.
	Contact Tip - Lincoln - 5/64th dia. Fits K-126 Mig Gun.
	Drive Roller Kit - Lincoln - 1/16th dia. - Fits LN-25 Feeder.
	Drive Roller Kit - Lincoln - 5/64th dia. - Fits LN-25 Feeder.
	Drive Roller Kit - Lincoln - 1/16th dia. - Fits LN-25 PRO Feeder.
	Drive Roller Kit - Lincoln - 5/64th dia. - Fits LN-25 PRO Feeder.
	Wire - Grounding - Lincoln - Connects K-126 Mig Gun to LN-25 Wire Feeder.
	Pliers - Mig Welding - Welper 8 in 1 Pliers.
	Blower, Utility, Portable 12" Electric - Outdoor Rated 120V. Global Ind. Sourced to IRS. Mandatory use when Welding or Grinding of Manganese.
	WELDING PPE
	Glasses - Cutting - Shade 5 (Clear face shield must be worn also)
	Gloves, welding, leather with aluminized back.
	Gloves, welding, leather. Size Small.
	Gloves, welding, leather. Size Medium.
	Gloves, welding, leather. Size Large.
	Gloves, welding, leather. Size X-Large.
	Jacket, Welding 30" length SMALL - Orange Flame Retardant - W/Refective Stripes.
	Jacket, Welding 30" length MEDIUM - Orange Flame Retardant - W/Reflective Stripes.
	Jacket, Welding 30" length LARGE - Orange Flame Retardant - W/Reflective Stripes.
	Jacket, Welding 30" length X- LARGE - Orange Flame Retardant - W/Reflective Stripes.
	Jacket, Welding 30" length 2X- LARGE - Orange Flame Retardant - W/Reflective Stripes.
	Jacket, Welding 30" length 3X- LARGE - Orange Flame Retardant - W/Reflective Stripes.
	Jacket, Welding 30" length 4X- LARGE - Orange Flame Retardant - W/Reflective Stripes.
	Jacket, Welding 30" length 5X- LARGE - Orange Flame Retardant - W/Reflective Stripes.
	Leggings - New Combination Leather and Metal - full wrap around Velcro Flap.
	CUTTING TORCH EQUIPMENT
	Torch, Arc-Air Electric - Model H-3 with 7 ft. Swivel Cable. Carbon Arc Gouging.
	Torch, SLICE - Metal Removal.

Item Number	Description
	Long Torch, Cutting, 36 inches long - Airco - 822-9555, 75 deg. Head.
	Torch, Cutting, 1 Pc.- 75 deg. Head - Airco 822-9515 - 21" 2 finger trigger - mid torch body.
	Tip, Cutting, Propane - Size # 3 - Airco Type 229.
	Tip, Cutting, Propane - Size # 4 - Airco Type 229.
	Tip, Cutting, Propane - Size # 5 - Airco Type 229.
	Tip, Cutting, Propane - Size # 6 - Airco Type 229.
	Tip, Cutting, Propane - Size # 7 - Airco Type 229.
	Torch, Cutting Attachment, Victor - CA-2460, 90 deg. Head.
	Torch, Cutting Attachment, Victor - CA-2461, 75 deg. Head.
	Tip, Cutting, Propane - Size # 3 HPN - Victor # 033-0325.
	Tip, Cutting, Propane - Size # 4 HPN - Victor # 033-0326.
	Tip, Cutting, Propane - Size # 5 HPN - Victor # 033-0327.
	Torch, Handle, Victor - HD 310C Note: Has Rev. Flow Check Valves Built-in. D0 NOT ADD.
	Preheating Head, Victor - Flathead - TWNB-5 (for preheating field welds)
	Torch, Cutting Attachment - SMITH 90 Degree Head VNG - DG209 Fits WH200 Handle
	Torch, Cutting Attachment - SMITH 75 Degree Head VNG - SC205 Fits WH200 Handle
	Tip, Cutting, Propane - Size # 3 - SMITH - VNG SC50A-3
	Tip, Cutting, Propane - Size # 4 - SMITH - VNG SC50A-4
	Tip, Cutting, Propane - Size # 5 - SMITH - VNG SC50A-5
	Torch Handle - SMITH - VNG WH200
	Preheating Head - SMITH Thermite Railroad VNG - 15674
	Mount - Oxygen-Propane Gauge Assembly Holder
	Regulator, Oxygen, VICTOR, two stage W/Guards - Smaller Design.
	Regulator, Propane, VICTOR, two stage W/Guards - Smaller Design.
	Flashback Arrestor, Oxygen Regulator Model.
	Flashback Arrestor, Propane Regulator Model.
	Reverse Flow Check Valve, Torch End, for fuel gas.
	Reverse Flow Check Valve, Torch End, for oxygen.
	Test Gauges - Railtech - SET = 1 Oxygen + 1 Propane Dial Protected
	Plug - Safety - Propane Tank - Brass With Chain & Ring.
	Protector, Cylinder Non-Rotating Valve - Oxygen, Wesco Model WES-010
	Protector, Cylinder Non- Rotating Valve - Propane, Wesco Model WES-008
	Igniter, torch, three flint, Shurelite Model 4501.
	Flint, renewal, for Shurlite Model 4501 igniter.
	Cleaner, tip, Wypo Number 1 Standard Set.
	Wrench, Cylinder, 10 Way combination. Forged steel, not stamped.
	Detector, external leak, SNOOP, 8 oz. bottle. Not for use to mounting hoses to fittings.
	Hose Reel - 1/4" ID - 100' Twin Hose Capacity.
	Hose Reel - 3/8" ID - 75' Capacity.
	Hose - welding, Grade T - 100' twin 1/4" dia. W/Fittings. Requires verbal approval of Weld. Manager.

Item Number	Description
	Hose - welding, Grade T - 100' twin 3/8" dia. W/Fittings. Requires verbal approval of Weld. Manager.
	Hose, welding, Grade T - 50' twin 1/4" dia. with fittings.
	Hose, welding, Grade T - 50' twin 3/8" dia. with fittings.
	Kit, welding hose repair, with crimper and fittings.
	BOUTET WELD FIELD KITS & ACCESSORIES
	Boutet Weld Field Kit 85 lb.
	Boutet Weld Field Kit 115 lb.1/4" Worn Both Sides.
	Boutet Weld Field Kit 115 lb.New to 1/4" Worn.
	Boutet Weld Field Kit 115 lb.3/8" Worn Both Sides.
	Boutet Weld Field Kit 115 lb.New to 3/8" Worn.
	Boutet Weld Field Kit 132 lb.1/4" Worn Both Sides.
	Boutet Weld Field Kit 132 lb.New to 1/4" Worn.
	Boutet Weld Field Kit 132 lb.3/8" Worn Both Sides.
	Boutet Weld Field Kit 132 lb.New to 3/8" Worn.
	Boutet Weld Field Kit 133 lb.3/8" Worn Both Sides.
	Boutet Weld Field Kit 133 lb.New to 1/4" Worn.
	Boutet Weld Field Kit 136 lb.New to 1/4" Worn.
	Boutet Weld Field Kit 136 lb.New to 3/8" Worn.
	Boutet Weld Field Kit 136 lb.New to 1/4" Worn.
	Boutet Weld Field Kit 136 lb. 3/8" Worn Both Sides.
	Boutet Weld Field Kit 100RA / 105 DUDLEY
	Boutet Weld Field Kit 100RE
	Boutet Weld Field Kit 100RB
	Boutet Weld Field Kit 110RE
	Boutet Weld Field Kit 115RE
	Boutet Weld Field Kit 122CB
	Boutet Weld Field Kit 127 DUDLEY
	Boutet Weld Field Kit 155#
	Boutet Weld Field Kit 132RE
	Boutet Weld Field Kit 136RE
	Boutet Weld Field Kit 140RE
	Boutet Weld Field Kit 141RE
	Boutet Weld Comp. Field Weld Kit 100RE/85
	Boutet Weld Comp. Field Weld Kit 100RE/90RA
	Boutet Weld Comp. Field Weld Kit 100RE/90RB
	Boutet Weld Comp. Field Weld Kit 100RE/100RB
	Boutet Weld Comp. Field Weld Kit 115RE/90RA Right Hand.
	Boutet Weld Comp. Field Weld Kit 115RE/90RA Left Hand.
	Boutet Weld Comp. Field Weld Kit 115RE/100RA
	Boutet Weld Comp. Field Weld Kit 115RE/100RE
	Boutet Weld Comp. Field Weld Kit 115RE/100NW Left Hand.
	Boutet Weld Comp. Field Weld Kit 115RE/100NW Right Hand.
	Boutet Weld Comp. Field Weld Kit 119/100 Left Hand.
	Boutet Weld Comp. Field Weld Kit 119/100 Right Hand.

Item Number	Description
	Boutet Weld Comp. Field Weld Kit 119/115
	Boutet Weld Comp. Field Weld Kit 127/115 Left Hand.
	Boutet Weld Comp. Field Weld Kit 127/115 Right Hand.
	Boutet Weld Comp. Field Weld Kit 122CB/100RB
	Boutet Weld Comp. Field Weld Kit 122CB/100RE
	Boutet Weld Comp. Field Weld Kit 122CB/115RE Right Hand.
	Boutet Weld Comp. Field Weld Kit 122CB/115RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 132RE/122CB
	Boutet Weld Comp. Field Weld Kit 132RE/127
	Boutet Weld Comp. Field Weld Kit 132RE/115RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 132RE/115RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 136RE/115RE Right Hand.
	Boutet Weld Comp. Field Weld Kit 133RE/115RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 133RE/115RE Right Hand.
	Boutet Weld Comp. Field Weld Kit 136RE/115RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 136-141RE/122CB
	Boutet Weld Comp. Field Weld Kit 136RE/119RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 136RE/119RE Right Hand.
	Boutet Weld Comp. Field Weld Kit 136-141RE/132RE
	Boutet Weld Comp. Field Weld Kit 136RE/133RE
	Boutet Weld Comp. Field Weld Kit 140RE/127RE
	Boutet Weld Comp. Field Weld Kit 140RE/132RE Left Hand.
	Boutet Weld Comp. Field Weld Kit 140RE/132RE Right Hand.
	Boutet Wide Gap Weld Kit 115RE.
	Boutet Wide Gap Weld Kit 119RE.
	Boutet Wide Gap Weld Kit 122CB.
	Boutet Wide Gap Weld Kit 132RE.
	Boutet Wide Gap Weld Kit 133RE.
	Boutet Wide Gap Weld Kit 136RE.
	Boutet Wide Gap Weld Kit 141RE.
	Boutet Crucible - CJ One Shot - Single Crucible Only.
	Boutet Refractory Paste
	Boutet Packing Felt
	Boutet Packing Sand (MUD) 8 lb.Individual Brick.(5 per case).
	Boutet Ignitor (Sparkler) U/M = each. Come 20 Ignitors per tube.
	Dry Sand - 50 lb. Bag
	Dry Sand - 1 lb. Bag.
	BOUTET HARDWARE
	Boutet Mold Jacket 110-141#
	Boutet Base Plate 107-141#
	Boutet Mold Clamp
	Boutet Slag Pan
	Boutet Crucible Fork W/Extention Guard
	Railtech Torch Stand - New Style - Fully Adjustable.
	Boutet Comp. Mold Jacket

Item Number	Description
	Boutet Base Plate - Small Rail - 85-105#
	Boutet Mold Jacket - Small Rail - 85-105#
	Boutet Base Plate Wide Gap Weld 110-141#
	Boutet Mold Jacket - Wide Gap Weld 110-141#
	Boutet Base Plate Compromise - 4 Ear Adjustable
	Boutet Cooling Retarder Cap
	Boutet Close Quarters Mold Jackets
	Boutet Close Quarters Base Plate with Detachable Ears.
	BOUTET WELD HAND TOOLS
	Hot Cut Chisel with 36" Handle
	Wedge - 6"L X 1- 3/8"W X 1"H. Grade B. Use in close quarters around switches.
	Wedge - Curved - 12" X 1- 1/8" With Strike Protection Installed.
	Protector - Chip - Rubber - Large
	Protector - Chip - Rubber - X-Large
	Alignment Plates - Rail - Thermite Welding - IRS # LMT02R - U/M = Pair.
	Canting Tool - Ratcheting tool to remove rail twist.
	Boutet Weld Demolder - Fits Standard and WGW's.
	Boutet Riser Removal Tool
	Firetong - To remove mold jackets from molds
	Removal Tool – Base plate and mold jackets
	Gap Gauge - 1" - Setting Gauge
	Straight Edge - Railtech Magnetic Adjustable
	Tool Set - Welders - Includes Tool Box.
	Fork - Garden - Narrow - D-Handle 8 Tine
	Hammer - Sledge 8 lb. Tampo W/36" Handle
	Maul - Spike - 10 lb. Grade B W/36" Handle
	Shovel - Size 2 - Square Point W/48" Handle
	Shovel Trenching Round Nose
	Punch - Track Grade B W/36" Handle
	Bar - Claw - per AREMA Drawing 11-97
	Mattock Pick W/Handle 6 lb.
	Lifter - Spike - W/Chip protector
	Protector - Spike Lifter Cover Kit.
	Ball Ratchet tool insulated
	Base Ratchet tool insulated
	Blanket, Silica Welding - control heat loss.
	Jumper Wire - 50 ft. With Orange Flags - attaches to ball of rail only.
	File - 14" Carbide Grit X-Course - No rubber handle - Used for filing Thermite Weld Molds.
	File - 14"- Carbide Grit Course -W/Rubber handle - Used for filing Thermite Weld Molds.
	Puller - Hyd. Rail - 120 TN. Simplex Model RP-120B
	Rail Grips - Replacement for Simplex Puller.
	Puller - Hyd. Rail - 120 TN. Geismar (Modern Track) Model TH-120
	Rail Grips - Replacement for Geismar (Modern Track) Puller.

	Description
	Hydraulic Quick Disconnect Fitting (Female)
	Hydraulic Quick Disconnect Fitting (Male)
	Cushion, KNEELMATE, 24" X 30" Orange Vinyl.
	MISCELLANEOUS
	Organizer - Tool - for bucket - 61 compartments - yellow/black - Grainger 4ZB46
	Bucket - Plastic 5 gal. - to be used with bucket organizer above.
	Umbrella - 9 ft.-3 inches.- Wide coverage - With Stake.
	Stopwatch - Digital W/Breakaway Lanyard.
	Fire Extinguisher - 2-1/2 Gal.- Stainless Steel - Fill with Water - Pressurize with Air. Comp.
	Sprayer - Water Tank - 5 Gal. Indian. IRS
	Sprayer - Water Tank - 15 Gal. Plastic tank with 12 Volt pump.
	Lube, Graphite, 12 oz. spray cans, 12 per case. Lube Hyd. Rail Puller Swingarms.
	Knife - Penguin HD P900C
	Knife - Cutter - EasyCut
	Replacement Blades for EasyCut Knife.
	Thermometer - Infrared - Laser Pointing with Case and batteries. IRS.
	Thermometer, Rail - Magnetic - Part # Dwg 34 -2.
	Tempilstik Marker - 300 Degree F., Box of 12.
	Tempilstik Marker - 450 Degree F., Box of 12.
	Tempilstik Marker - 500 Degree F., Box of 12.
	Tempilstik Marker - 700 Degree F., Box of 12.
	Tempilstik Marker - 800 Degree F., Box of 12.
	Spill Kit
	Red Box - Storage for aerosol cans.
	Hand cleaner - pop up dispenser
	Hand Towels - Blue - Disposable - Roll.
	Tachometer, optical, digital readout, non- contact, instructions, case, batteries, tape.
	Reflective Tape for optical tachometer, 5 ft. roll.
	Sling, cylinder, nylon, 1000 lb. capacity. Liftex CG10A
	Tag Line - 3/8" X 30FT. Snap Lock End - Nylon Rope
	Tag Line - 1/2" X 30FT. Snap Lock End - Nylon Rope
	Marker - Valve Action - For Marking Rail - White
	Marker - Valve Action - For Marking Rail - Yellow
	Marker - White - For Marking Rail.- Pump Style
	Marker - Green - For Marking Rail.- Pump Style
	Box - Saw Blade Storage 14" Dia. Blades
	Box - Saw Blade Storage 16" Dia. Blades
	Ratchet Strap 2" X18' long 3,330 lb.Load limit, D-ring hooks.To Secure Hyd.Rail Puller
	Ratchet Strap 1" X 12'- S-Hooks Load Limit = 1,000 lbs. Secure Welding Cylinders
	Spark Shield (Little Sparky) Shield for Grinding
	Straight Edge W/ Frog Ruler
	Straight Edge, 18" long, Starrett Number 385-18
	Straight Edge, 36" long, Starrett Number 385-36

Item Number	Description
	Gauge, taper, 6-1/4" long X 0.150" thick, Starrett Number 270.
	Gauge, step gauge up to 7/8" H (in 1/8" increments). Use with conformal frog guage.
	Ground Fault Circuit Interrupter, 2' Cord

APPROVED ABRASIVE BLADES AND WHEELS

Item Number	Description
CUTTING RAIL	
	14" X 1/8" X 1" Abrasive saw blade, fully reinforced, Maximum 5400 RPM
	16" X 1/8" X 1" Abrasive saw blade, fully reinforced, Maximum 4800 RPM
	26" X 7/32" X 1-3/4" Abrasive saw blade, fully reinforced, Maximum 2090 RPM
	14” X 1/8” X 1” Abrasive saw blade, aluminum oxide, double reinforced, Max 5400 RPM
	14” X 1/8” X 1” Abrasive saw blade, premium grade, double reinforced, Max 5400 RPM
	14” X 1/8” X 1” Abrasive saw blade, superior grade, double reinforced, Max 5400 RPM
	16” X 1/8” X 1” Abrasive saw blade, aluminum oxide, double reinforced, Max 4800 RPM
	16” X 1/8” X 1” Abrasive saw blade, premium oxide, double reinforced, Max 4800 RPM
	16” X 1/8” X 1” Abrasive saw blade, superior oxide, double reinforced, Max 4800 RPM
	26" X 7/32" X 1-3/4" Abrasive saw blade, double reinforced, Maximum 2100 RPM
SLOTTING RAIL	
	8” X 5/32” X 5/8” Abrasive grinding wheel, fully reinforced, Maximum 7640 RPM.
	8” X 1/8” X 5/8” Abrasive slotting wheel, fully reinforced, Maximum 7640 RPM.
GENERAL GRINDING	
	4-1/2" X 1/4" X5/8"-11 Abrasive Grinding - MINI Disk.
	8" X 1" X 5/8" Abrasive grinding wheel, fully reinforced, Maximum 4535 RPM
	8" X 1/4" X 5/8"-11 Abrasive grinding wheel, fully reinforced, Type 27, Max 6600 RPM.
	9" X 1/8" X 5/8"-11 Abrasive grinding wheel, fully reinforced, Type 27, Maximum 6600 RPM.
SURFACE GRINDING	
	8" X 2" X 1 1/2" Type-6 abrasive grinding wheel, fully reinforced, tape wound, Maximum 5250 RPM
	8" X 2" X 2" Plate mounted, 4 bolt grinding wheel, tape wound, Maximum 4500 RPM
	6/4-3/4" X 2" X 5/8" -11 Flaring cup abrasive grinding wheel, Maximum 6000 RPM
	9" X 1/4" X 7/8" Abrasive grinding wheel, fully reinforced, Max 6600 RPM

STOCK RAIL & SWITCH POINT GRINDING MACHINE	
	10” X 1-1/2” X 1” Recess one side 6” X ½”, abrasive grinding wheel, fully reinforced, Maximum 3630 RPM.

WEB GRINDING	
	6" X 2-1/4" X 1" Recess one side 2-3/8" X 1", abrasive grinding wheel, fully reinforced , Maximum 6050 RPM.
	8" X 1/2" X 5/8" Wire brush wheel, Maximum 6000 RPM

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PURPOSE:	To establish uniform procedure governing the construction and rehabilitation of Road Crossings and the selection of Road Crossing Surface Materials.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC owned or maintained tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State and Local Environmental Rules and Regulations.
REFERENCES	CFRC Track Works – Road Crossing Installation. Standard Drawings: 2521, 2522, 2524, 2527, 2535, 2536, 2538, 2539, 2602 and 2613.

I. DISCUSSION

A. Many crossings are covered by contracts. A review for contractual obligations should be made to ensure CFRC constructs the crossing as required and is reimbursed accordingly.

B. Coordination with the proper governmental agency or outside party responsible for the crossing is essential.

1. All street and road closures must be coordinated prior to closing.

2. Proper barricades must be placed at all crossings during the time that they are closed to prohibit vehicles from entering the work zone. All state and local regulations must be met in the erection and installation of these barricades.

3. Many States highway and local road departments have policies, which allow them to assist in providing barricades, detour routing, and/or paving at no cost to CFRC. In the initial contact with the governmental agency, arrangements must be made to obtain this assistance where available.

4. A review of the highway traffic density, both current and projected, must be made during the planning for the project.

5. In some cases the crossing to be repaired may be the only access and special arrangements must be made such as:

a. Coordination with local resident/residents to leave their vehicle on the opposite side of the crossing.
b. Having material readily available to place in quickly to allow emergency vehicles access.
c. Constructing a temporary crossing.
d. Adjust work hours if necessary to accommodate special needs.

6. See Planning and Installation Checklist attached to this instruction and provided as a separate document.

C. The horizontal and vertical geometrics of highway crossings require special attention. Highway crossing areas are usually areas that have multiple ownership and that alignments may be dictated by the governmental organization that controls the highway. The following design concepts were extracted from the *Policy on Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials. They should be considered where appropriate.

1. Horizontal Alignment – If practical, the highway should intersect the track at right angle with no nearby intersections or driveways. This layout will enhance the vehicle driver's and locomotive operator's view of the crossing area, reduces conflicting vehicular movements from crossroads and driveways, and is preferred for two wheeled vehicles. To the extent practical, crossings should not be located on railroad or highway curves.

2. Vertical Alignment – It is desirable from the standpoint of sight distance, ride ability, braking and acceleration distances that the crossing be made as level as practical. Vertical curves should be of sufficient length to ensure an adequate view of the crossing. In some instances, the roadway vertical alignment may not meet acceptable geometrics for a given design speed because of restrictive topography or limitations of right-of-way. As a recommended guideline, the crossing surface should be on the same plane as the top of rail for a distance of 30 inches outside the rails[1]. The surface of the highway should also not be more than 3 inches higher or lower than the top of the nearest rail at a point 30 feet from the rail unless superelevation makes a different level appropriate. Tracks that are superelevated or a roadway approach that is not level, require site specific analysis.

II. CRITERIA REQUIRED FOR A QUALITY CROSSING

Road crossing construction and rehabilitation is resource intensive and disruptive to rail and highway traffic, therefore special care must be taken to ensure that the crossing is properly installed. The entire "Crossing Zone" requires special care and maintenance practices. The "Crossing Zone" is the crossing surface including all new required pavement and the track / right of way approaching the crossing for 50 feet each side of the crossing.

A. DRAINAGE

1 High speed roadways (50MPH and greater) with considerable truck traffic (20% and greater) should have the level distance increased to 20 feet.

1. If the crossing is well drained and shows no signs of subgrade problems, extra care must be taken to ensure that drainage facilities and “hard pan” are not damaged. “Hard pan” is a densely compacted layer of ballast and other materials lying beneath the ties. It is relatively impervious and acts like a subballast layer. This layer must be located at a depth that will promote drainage and not pool water.

2. Good drainage must be provided from all four quadrants of the crossing and crossing zone. Ditches, pipes and/or French drains should be installed, if necessary, to obtain the adequate drainage. Check and maintain all existing pipes and ditches on the right-of-way that drain the crossing zone.

3. A level granular working area must be provided around highway crossing warning devices. If this area is excavated for drainage, it should be filled with free draining size #5 ballast (see MWI 301). Provisions must be made to protect buried cables. Normally a level area 6 feet to the front / side and 2 feet to the rear of the mast foundation is required for maintenance of gate or flasher mechanisms. Refer to drawing 2613 for details.

4. Roadway approaches and ditches should be sloped or diverted away from the crossing.

5. In cases where roadway descends to the crossing, other drainage mechanisms such as slot drains should be considered to divert as much water away from the crossing as possible.

6. If there is evidence of sub-grade problems, the stability must be improved. Consider using asphalt (HMA) underlayment, geogrids, or geotextiles. When these materials are used, they must be installed in accordance with the instructions contained in MWI 1003 or MWI 1004.

B. BALLAST

1. Ballast in the crossing must be granite or trap rock meeting CFRC Specifications (MWI 301).

2. **Ballast must be clean and free draining** both in cribs and under ties within the crossing. Tracks that have ties replaced or surfaced must have a minimum of 4 inches of ballast below bottom of tie after tamping is complete. Tracks that are renewed by panel method will comply with standard drawings (12 inches of ballast under the tie). Engineering judgment may be used to reduce the depth of ballast required under a panel based on existing site conditions; at no time should the depth of ballast be reduced to less than 4 inches under the crossties.

3. Ballast within the entire crossing zone must be clean. Ballast that is fouled with mud or debris can degrade the proper operation of crossing warning devices.

4. If ties are replaced in the crossing, the ballast must be renewed.

5. A sufficient quantity of ballast to perform crossing renewal and planned track raise must

be available on site to prevent delay in restoring the track upon crossing installation.

6. Ballast cross section below bottom of tie which supports the track must be compacted solidly before the crossing surface and pavement approaches are placed. Preferred methods of compaction are:
   a. Vibratory roller
   b. Train traffic (4 tonnage trains or 20,000 tons accumulated minimum)
   c. Dynamic Stabilizer
      - Cribs must be filled with ballast during operation.
      - 2 to 3 passes but shall not violate manufacturer's operating instructions.

7. The finished ballast cross-section in the crossing zone approaching the crossing must comply with Standard Drawing 2602. Care must be taken to ensure that no surplus ballast is present to impede drainage except as noted in paragraph II.A.3 above. Additional drainpipe may be required.

C. CROSSTIES

1. The old pavement should be saw cut three (3) feet from the rail. If ties are to be inserted, locate the saw cut on one side approximately six (6) feet from the rail or the minimum needed to install the ties. This will vary depending on site conditions and material used (panel installation, 8 foot 6 inch vs. 10 foot ties).

2. All ties through the entire crossing must be in a like new condition, wood, and provide consistent support. If any single tie needs to be replaced, it will be replaced with a new tie and all remaining ties through the entire crossing and the 5 approach ties must be in like new condition. If multiple locations of consecutive ties need to be replaced, then all ties within the crossing will be replaced. Branch line ties and relay ties will not be installed within the crossing.

3. If ties removed from the crossing are still sound, they may be reinstalled in tangent track.

4. Ten-foot wood ties are required for all full width concrete road crossing surfaces. These 10-foot wood ties must extend for a minimum of 10 ties beyond each end of crossing

5. Crossings in concrete tie territory are to be constructed on 10-foot long wood ties with positive restraint fasteners and plates. These 10-foot wood ties must extend for a minimum of 10 ties beyond each end of crossing as a transition to concrete ties. The use of clips with corrosion prevention coating should be considered.

6. Ties should be installed using the most appropriate method for the particular crossing. Normal methods include:
   a. Mechanized tie installation equipment
   b. Pre-plated ties (see drawing 2532)
   c. Tie packs (see drawing 2526)
   d. Track Panels (see drawing 2515)

7. During tie replacement or track panel construction, the ties will be placed on 19 - ½ inch centers for rubber interface andtimber crossings. For concrete and full depth rubber crossings, compy with manufacturer's requirements for tie spacing.

8. Tie plates / fasteners should prevent rail movement and rotation. Tie plates must be replaced if worn beyond the limits shown below:
   - Shoulder height 11/32 inch minimum
   - Rail seat width (6 in. base rail) 6-1/4 inches maximum
   - Rail seat width (5-1/2 in. base rail) 5-3/4 inches maximum
   - Spike hole size 27/32 inch maximum
   - Plate thickness at edge 11/32 inch minimum
   - Rail seat flatness 1/16 inch maximum convex
   - Plate bottom flatness 1/8 inch maximum convex

9. All ties in the crossing are to be spiked with two rail-holding spikes on the gage side and two on the field side. If the plates do not have the rail holding positions then plates will be replaced. Positive restraint fastener plates will be installed per standard drawing 2512.

D. RAIL

1. Rail should be replaced if existing rail:
   a. has surface imperfections
   b. is surface bent
   c. has less than 9 years of expected life
   d. is programmed for renewal within the crossings expected service life
   e. has excessive base wear or nicks (limits are)
      - base width (6" base rail) 5-7/8 inches minimum
      - base width (5-1/2" base rail) 5-3/8 inches minimum
      - notching in base not visible

2. No bolted rail joints are allowed in the crossing.

3. Thermite welds may not be located within the crossing on main tracks and sidings and should not be located within crossings on other tracks.

4. No bolted rail joints are allowed within the Crossing Zone on main, branch or siding tracks, where the rail is greater than 110 lbs/yd. They may be closer to the crossing on other tracks at the discretion of the Chief Engineer.

5. Only bonded insulated joints are permitted in the Crossing Zone on main, branch or siding tracks.

6. Bolted joints within the Crossing Zone must be welded out as soon as possible.

7. Thermite welds in the crossing zone due to rail replacement or panel installation must be

made within 3 days.

8. Thermite welds in the crossing zone should be staggered and at least 10 feet away from the edge of the crossing, and supported by good ties.

9. Ensure that the rail anchoring pattern is correct. See MWI 703.

E. SURFACING

1. If practicable in multiple track crossings, all tops of rail should be brought to the same plane.

2. The minimum practical track raise should be used to limit its effect on the highway profile. Coordinate with the proper governmental agency or outside party responsible for the crossing as necessary.

3. Crossings should be surfaced so that at least one future surfacing cycle can be performed without the crossing being left lower than the surrounding track. The track runoff will be located outside the crossing zone.

4. Solid tamping is important. The tamper must use double insertions and, if capable, tamp the total length of the tie. Care must be taken to avoid center binding of the tie.

5. When track is tamped, ballast **MUST** be compacted before the crossing surface and pavement are placed. Preferred methods of compaction are:
   a. Train traffic overnight (4 tonnage trains or 20,000 tons minimum)
   b. Dynamic Stabilizer (2 to 3 passes for 50 feet each side of crossing but shall not violate manufacturer's operating instructions)

6. The finished ballast cross-section in the crossing zone approaching the crossing must comply with Standard Drawing 2602 with no surplus ballast to impede drainage except as noted in paragraph II.A.3. Permitted cross-section tolerances for track maintenance work are given in MWI 1113, section H.

F. TEMPORARY CROSSING

1. Ballast & Cold Mix
   a. Must be of sufficient quantity and strength to support the expected road traffic.
   b. Cold mix must be removed from the track as soon as it is not needed. Use a double or triple layer of filter fabric to aide in removing cold mix while keeping ballast clean.
   c. Ballast must be standard CFRC specification for main track. Other materials are not permitted.

2. Modular Temporary Crossing
   a. Must be of sufficient size and strength to support the expected road traffic.
   b. Must be secured to track.

G. CROSSING SURFACE MATERIAL AND INSTALLATION

1. Material:
   a. There are several CFRC Standard Road Crossing designs. Unless the crossing is covered by an agreement/contract, the Standard design will be determined during the preplanning inspection. The Chief Engineer will select the appropriate Standard design for other projects.
   b. A heavy duty crossing surface is justified on heavy vehicular traffic roads.
   c. See Section III for details on available crossing surface materials.

2. General installation:
   a. The ends of rubber interface sections, located in traffic lanes, must be supported on a tie.
   b. Concrete and other crossing surface materials should be installed according to the manufacturer's instructions.
   c. Where truck traffic is considerable (20% and greater), a concrete header or apron may be considered. This is placed adjacent to the concrete crossing surface to absorb impact.
   d. Spike at end of crossing on both sides should be heeled over to secure wood filler blocks or rubber interface from sliding out. The wood filler blocks or rubber interface will most likely move in the direction with the greatest traffic.
   e. For concrete crossing panels, comply with specification 901A, as attached.

H. ASPHALT PAVEMENT

1. The paving contractor will saw cut the existing pavement before the reconstruction. See Section II.C.1 for location criteria.

2. The crossing surface will extend a minimum of two (2) feet beyond the edge of the existing roadway / sidewalk or comply with state regulations, whichever is greater. Other widths must have the approval of the Director Engineering Standards or the Division Engineer.

3. Estimated quantity of asphalt pavement should be accurate to ensure quality and minimize waste. Saw cutting of asphalt prevents unintentional removal of material; therefore cut asphalt for tie replacement approximately 6 feet from the edge of rail on tie installation side and 3 feet on the opposite side. For this kind of work, estimate 0.9 ton per linear track foot. For routine surface work through crossing saw cut at 3 feet from the rail on both sides. For this kind of work, estimate 0.7 ton per linear track foot.

4. Ballast under the asphalt pavement must fill in the cribs including under the rubber or timber flangeway and field interface sections. Shoulder ballast must be level with top of tie and compacted with vibratory equipment by the asphalt-paving contractor prior to paving.

5. Asphalt pavement should be full depth between top of tie and road surface except for farm / residential crossings. Compacted pavement must be thick enough to lock into the rubber interface material.

6. Tack coat must be used where new asphalt meets old pavement. The Tack must meet the FDOT standard specifications.

7. Asphalt (bituminous concrete) pavement used must be a dense-graded mix, which meets the FDOT standard specification 334 for asphalt pavement construction. Certificates must be given to the Roadmaster.
   a. 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.
   b. The asphalt pavement must be placed and compacted in a minimum of 2 lifts (4 inch maximum per lift).

8. Asphalt pavement material must be sufficiently hot (minimum 200°F) for proper compaction. Optimal temperature is greater than 250°F.

9. The roller used to compact the asphalt should be a steel-wheeled vibratory type. It must be narrow enough to fit between the gage side flangeway interface material and between the outside of the crossing and old pavement. It should exert a minimum force of 12,000 lb/roll at 2400 vpm and operated at a speed of less than 3 ft/sec. Normally, a 36-inch vibratory roller will meet these criteria. A roller with equivalent compaction force but less than 26” wide must be used between the rails on a Rubber / Asphalt / Timber (RAT) or Timber / Asphalt type crossing.

10. The roller must be operated parallel to the rail and up against the rubber, concrete, or timber surface material to ensure good asphalt compaction. Use caution not to dislodge rubber interface sections or the clamps / spikes that secure the rubber.

11. Asphalt should be compacted to at least 91% of maximum theoretical density (air voids less than 5% in the compacted mix). For quality assurance, asphalt core borings may be taken to verify compliance.

12. Paved road surface should be level with the top of rail for 30 inches from the field side of each rail unless there is a conflict with State regulations. In case of a conflict, the State regulations will govern. For new construction, highway surface should not be more then 3 inches higher or lower than the top of the near rail 30 feet from the rail along the road centerline, unless track superelevation dictates otherwise. If practicable, slope the pavement 1 inch in 10 feet to meet existing highway surface. On high speed roads (50MPH and greater), the surface may have to be even smoother to reduce impacts on the crossing surface. High speed roadways with considerable truck traffic (20% and greater) should have the level distance increased to 20 feet.

13. On unpaved roads, the asphalt pavement on the field side of the rail must be of sufficient volume so it does not move or slip away from the rail under the expected roadway traffic. State regulations may require a minimum length “apron”.

14. The crossing should be closed to highway traffic long enough for the hot asphalt pavement to cool (hand touchable) and stiffen to support loads without rutting.

15. The old pavement removed may not always be the same amount that was delivered for the current paving project. For example, the maximum thickness should be approximately 8” for any paving project. Depending on rail height, the *average* crossing timber is 8”. If a previous paving project had a thicker pavement section due to insufficient fill material (e.g. ballast), the amount of pavement removed will be greater than what was delivered if done correctly with sufficient fill material. This should be noted on the paving invoice.

16. Old pavement, ballast, and surface material must be disposed of in a proper manner complying with CFRC policies. Refer to Environmental Guidelines manual.
    a. Different materials must be handled separately for removal or stockpile at CFRC designated sites.
    b. Asphalt pavement with only some ballast stuck to the bottom may be a recyclable material so keep it as clean at possible.

I. QUALITY ASSURANCE

1. Crossing rehabilitation or construction is to be performed to meet these instructions. Failure of rail, track surface and gage, or roadway surface should not occur within the intended maintenance cycle. Engineering may direct or perform sample inspections of the following activities or materials:
    - Drainage
    - Ballast
    - Ties
    - Crossing material
    - Pavement (asphalt may be cored to verify material characteristics and density)
    - Rail and welding

2. If a crossing fails before its intended maintenance cycle and it requires a speed restriction for rail traffic or a detour for vehicular traffic, a report will be made by the Chief Engineer to the CFRC Maintenance of Way Manager.

   The report should describe the problem and contain photographs.

J. POSITIVE TRAIN CONTROL

1. It is best practice to reference the end of an existing road crossing surface with marking the rail with paint before removing the existing material. If multiple tracks (e.g. double main line) are being worked on, mark the location of the end of each road crossing using paint for both rails.

2. Any road crossing whose length changes greater than one foot (1') must enter a change request per MWI 2114.

III. MATERIAL SELECTION

(Also refer to drawings 2521, 2522, 2524, 2527, 2535, 2536, 2538 and 2539)

CFRC has six (6) standard crossing surfaces for wood tie installations. There are 4 basic levels of service based on the amount and severity of the highway crossing traffic. They are:

1. Heavy Duty (1 design, drawing 2527)
2. Normal Duty (3 designs, drawings 2535, 2536, and 2538)
3. Light Duty (1 design, drawing 2521)
4. Farm / Residential Use (2 designs, drawings 2522 and 2536)

There is no specific criteria as to which crossing design should be used, and discretion should be exercised on a case by case basis, but generally, the heavier the truck traffic, the faster the highway speed, or the higher the railroad tonnage is, the more durable the crossing should be. Consideration should be given to consider the recommendation of state and local authorities if they have expressed it. Refer to the paragraphs below for more information. Factors to consider are:

1. Severity of interrupting the railroad
2. Severity of interrupting the highway
3. Railroad tonnage and speed
4. Highway vehicle traffic count
5. Highway vehicle weights
6. Highway vehicle speed

Many Highway Departments measure traffic or vehicle count as AADT (Average Annual Daily Traffic) and Truck AADT (Truck Average Annual Daily Traffic). If this data is available, use it in conjunction with the following chart. When using this method, one truck equals 100 cars.

The governmental agency or outside party responsible for the road at the crossing should be contacted to determine vehicle count. For light duty, private, farm and residential crossings, gather information from the person contacted to close the crossing.

The type of crossing material selected should generally follow the chart below:

HIGHWAY TRAFFIC **RAILROAD TRAFFIC**

Cars per Day*	**0 – 10 MGT / year**	**10+ MGT / year**
0 – 50,000	Normal Duty (Rubber / Asphalt / Timber) See paragraph A2 Normal Duty (Timber / Asphalt) A3 [1] Light Duty (Rubber / Asphalt) A4 [2] Farm Duty (Rubber / Asphalt) A5 [2] Farm Duty (Timber / Asphalt) A6	Normal Duty (Rubber / Asphalt / Timber) See paragraph A2 Normal Duty (Timber / Asphalt) A3 [2] Farm Duty (Timber / Asphalt) A6
50,000 – 100,000	Normal Duty (Rubber / Asphalt / Timber) A2 Normal Duty (Timber / Asphalt) A3	Heavy Duty (Concrete on 10’ wood ties) A1 Normal Duty (Rubber / Asphalt / Timber) A2 Normal Duty (Timber / Asphalt) A3
100,000+	Heavy Duty (Concrete on 10’ wood ties) A1	Heavy Duty (Concrete on 10’ wood ties) A1

*** When calculating cars per day, multiply each truck by 100.**

[1] Crossing must handle less than 5000 cars per day.

[2] Crossing must handle less than 500 cars per day.

If track warrants Positive Restraint Fasteners (Pandrol or NorFast Plates), use Heavy Duty Concrete (A1) or Light Duty Rubber / Asphalt (A4) as appropriate.

A. WOOD TIE INSTALLATIONS – CFRC has designs for heavy, normal, light duty and farm / residential duty applications for crossings. These designs use various combinations of concrete, timber, or rubber interface and asphalt pavement material.

1. Heavy Duty Highway Crossings (Concrete) – Shown on CFRC Standard Drawing number 2527. This crossing material consists of 9 ft. long concrete center (gage) and field panels. They must be installed on 10 ft. ties. Concrete crossings shall comply with specification 901A, as attached.

   The crossing information follows:

Rail Weight	*Description*
115 – 122	Crossing Concrete Panels, Heavy Duty, for 10-foot wood ties. Order by “Track Feet” in approximately. 8-ft. increments.
132 – 136	
141	Each 8-ft. 1-1/2 in. section incl. 1 concrete center panel and 2 concrete field panels with rubber flangeway fillers.

Approximate weights of these panels are:

Center Panel,	115 – 122 lb. rail	2850 pounds
Field Panel,	115 – 122 lb. rail	1550 pounds
Center Panel,	132 – 141 lb. rail	3125 pounds
Field Panel,	132 – 141 lb. rail	1675 pounds

The heavy duty concrete crossing design should be used where the preponderance of the highway traffic is composed of trucks, where the environmental or other concerns for the disposal of asphalt must be minimized and/or where maintenance history indicates a need for its use.

2. Normal Duty Highway Crossing (Rubber / Asphalt / Timber) (RAT) – Shown on CFRC Standard Drawing number 2535. This design uses 10 inch wide by 8 ft. 1-1/2 in. long wooden timbers that are placed against rubber interface material adjacent to the rails. The timbers are attached to the ties with timber screws. Use equipment, such as a backhoe arm, to handle crossing timbers. **Do not** use hands to handle crossing timbers. This will give the crossing more strength. Clamps for the rubber interface are not needed. Full depth compacted asphalt pavement is used for the remaining road surface area. The information for the RAT crossing timber follows:

Rail Weight	*Description*
115 – 122	Crossing Timbers 7-1/2” thick 8’ 1-1/2” long per CFRC drawing 2535. Four timbers per bundle (2 gage, 2 field). Use with rubber rail seal. Order by “Track Feet” in 8-ft. increments.
132	Crossing Timbers 8” thick 8’ 1-1/2” long per CFRC drawing 2535. Four timbers per bundle (2 gage, 2 field). Use with rubber rail seal. Order by “Track Feet” in 8-ft. increments.
136 – 141	Crossing Timbers 8-3/8” thick 8’ 1-1/2” long per CFRC drawing 2535. Four timbers per bundle (2 gage, 2 field). Use with rubber rail seal. Order by “Track Feet” in 8-ft. increments.
all	Screw Timber 5/8” X 12” with Torx square washer head.

3. Normal Duty Highway Crossing (Timber / Asphalt) – Shown on CFRC Standard Drawing number 2536. This design uses 10 inch wide by 8 ft. 1-1/2 in. long wooden

timbers with wooden filler blocks adjacent to the rails. The timbers are attached to the ties with timber screws. Use equipment, such as a backhoe arm, to handle crossing timbers. **Do not** use hands to handle crossing timbers. Full depth compacted asphalt pavement is used for the remaining road surface area. The information for this timber follows:

Rail Weight	*Description*
115	Crossing Timbers 7-1/2" thick 8' 1-1/2" long with wood filler blocks per CFRC drawing 2536. Four timbers per bundle. Order by "Track Feet" in 8-ft. increments.
122	Crossing Timbers 7-1/2" thick 8' 1-1/2" long with wood filler blocks per CFRC drawing 2536. Four timbers per bundle. Order by "Track Feet" in 8-ft. increments.
132	Crossing Timbers 8" thick 8' 1-1/2" long with wood filler blocks per CFRC drawing 2536. Four timbers per bundle. Order by "Track Feet" in 8-ft. increments.
136	Crossing Timbers 8-3/8" thick 8' 1-1/2" long with wood filler blocks per CFRC drawing 2536. Four timbers per bundle. Order by "Track Feet" in 8-ft. increments.
140	Crossing Timbers 8-3/8" thick 8' 1-1/2" long with wood filler blocks per CFRC drawing 2536. Four timbers per bundle. Order by "Track Feet" in 8-ft. increments.
141	Crossing Timbers 8-3/8" thick 8' 1-1/2" long with wood filler blocks per CFRC drawing 2536. Four timbers per bundle. Order by "Track Feet" in 8-ft. increments.
all	Screw Timber 5/8" X 12" with Torx square washer head.
all	Counterbore diameter 1/2" double flute to be added to step drill (015.0001283.1) & attached with set screw.
all	Socket Adapter 1" Drive for 5/8" hex insert Torx bit.
all	Socket Retainer for 1" Drive impact.

4. Normal Duty Highway Crossing (Timber/Asphalt) for use with 18" tie plates--) – Shown on CFRC Standard Drawing number 2538. This design uses a 10 inch wide by 6 ft. 8-1/2 inch. long wooden timber with wooden filler blocks adjacent to the rails for the gage side and a 16-1/2 inch wide by 6 ft. 8-1/2 inch long wooden timber with wooden filler block

for the field side. The timbers are attached to the ties with timber screws. Use equipment, such as a backhoe arm, to handle crossing timbers. **Do not** use hands to handle crossing timbers. Full depth compacted asphalt pavement is used for the remaining road surface area. The information for this timber follows:

Rail Weight	*Description*
122	Crossing Timbers 7-1/2” thick 6.75’ long with wood filler blocks per CFRC drawing 2538. Four timbers per bundle. Order by “Track Feet” in 6.75-ft. increments.
132	Crossing Timbers 8” thick 6.75’ long with wood filler blocks per CFRC drawing 2538. Four timbers per bundle. Order by “Track Feet” in 6.75-ft. increments.
136	Crossing Timbers 8-3/8” thick 6.75’ long with wood filler blocks per CFRC drawing 2538. Four timbers per bundle. Order by “Track Feet” in 6.75-ft. increments.
140	Crossing Timbers 8-3/8” thick 6.75’ long with wood filler blocks per CFRC drawing 2538. Four timbers per bundle. Order by “Track Feet” in 6.75-ft. increments.
141	Crossing Timbers 8-3/8” thick 6.75’ long with wood filler blocks per CFRC drawing 2538. Four timbers per bundle. Order by “Track Feet” in 6.75-ft. increments.
all	Bit Drill Step 11/16" With 3/8" Pilot 18" Overall Length
all	Screw Timber 5/8” X 12” with Torx square washer head.
all	Bit Torx adapter Insert 5/8" Impact 1" Drive
all	Counterbore diameter 1/2" double flute to be added to step drill (015.0001283.1) & attached with set screw.
all	Socket Adapter 1" Drive for 5/8" hex insert Torx bit.
all	Socket Retainer for 1" Drive impact.

5. Light Duty Highway Crossings (Rubber / Asphalt) – Shown on CFRC Standard Drawing numbered 2521. This design uses rubber interface material with full depth compacted asphalt pavement on the both sides of the rails. It is only permitted on tracks with less than 10 annual MGTs and highways less than 5,000 Cars per Day. Existing rubber interface material should be used where available.

   The information follows:

Rail Weight	*Description*
90 – 100 115 122 132 136 140 141	Crossing, Rubber Interface Light duty, for wood ties. Order by "Track feet" in 8 ft. increments. Each "Track foot" includes 2 gage side and 2 field side sections.
90 – 141	Clip/Clamp which may be used to secure rubber. Use in each crib.
132 – 136 141	Crossing, Rubber Interface Light duty for Pandrol plates on wood ties.
132 – 141	Clip/Clamp which should be used to secure rubber interface on Pandrol plates.
	Installation tool for Clip/Clamps

6. Farm / Residential Road Crossings (Rubber / Asphalt) – These very light duty road crossings are defined as private roads, city streets and with vehicular traffic speeds of 25 MPH and lower and with less than 500 Cars per day. This design is not permitted if trucks use the crossing. If the road will be handling trucks, use one of the previous designs. It is only permitted on tracks less than 10 annual MGTs. See CFRC Standard Drawing number 2522. This design uses lighter weight virgin rubber or used rubber field and flangeway interface material, with a minimum of four (4) inches of compacted asphalt.

7. Farm / Residential Crossings (Timber / Asphalt) – These are private crossings that conform to very light duty traffic criteria, and serve a limited number of users. Examples would be a road connecting two farm fields, a road providing access to an individual home, or an infrequently used access to a commercial site, such as a billboard or pumping station. The limited service requirements of these crossings allow the use of cascaded materials and minimization of asphalt quantities. Use equipment, such as a backhoe arm, to handle crossing timbers. **Do not** use hands to handle crossing timbers. Crossing material should be economized at these locations. The design is similar to the T / A crossing (Drawing 2536) but uses less asphalt pavement. Use the following guidelines:
   a. Use second hand wood material if available or order material described for Standard Duty crossings.

b. In crossings not susceptible to frost heave such as areas below TN & NC, compacted asphalt pavement thickness to be 3 inches minimum to 4 inches maximum.

8. Former Normal Duty Highway Crossing (Concrete / Rubber / Asphalt) – This former standard, shown on CFRC Standard Drawing number 2524 uses a concrete panel with rubber flangeway filler between the rails and rubber interface material with full depth compacted asphalt pavement on the field sides of the rails. If the crossing material is in good condition and the crossing has performed satisfactorily, it may be reinstalled. If the material is in good condition but the asphalt pavement broke up, use the crossing material in a lower duty crossing or add timbers against the rubber like the RAT crossing design for added strength.

B. Private crossings will be considered the same as a public crossing with similar traffic volumes. Some private crossings, such as concrete plant entrances, will usually have heavy truck traffic. These industrial crossings should use normal or heavy duty material.

C. Care must be taken to ensure that the correct type of rubber interface material is installed. Manufacturer's warranty (minimum of 10-year life) can only be honored if the rubber interface material is properly matched to the highway traffic conditions.

D. All other crossing other crossing materials installed on CFRC owned and/or maintained tracks must be approved by the CFRC Maintenance of Way Manager. Road crossings, which are ~~f~~unded by Outside Parties, may be constructed with concrete slab or full depth rubber if specified by the Outside Party.

Platform (tieless, modular, or tub) type crossings are approved where track speeds do not exceed 15 MPH and tonnage does not exceed 10 MGT. These types of crossings should have 10 each 10' wood crossties on both approaches to transition to open track. Other applications of platform crossings must include a feasibility analysis with arrangements for inspection and approval from the CFRC Maintenance of Way Manager prior to installation.

Refer to drawing 2539 for additional specifications. If the outside party desires to use another premium crossing, prior arrangements and approval must be obtained from the CFRC Maintenance of Way Manager.

E. Other crossing designs or materials such as composites, if approved by the CFRC Maintenance of Way Manager, may be considered on an individual location basis.

F. Field side grinding relief is not required in any crossing surface.

G. Rubber interface material is to be ordered by the track foot for a specific crossing and installed at that location.

H. When material is ordered for crossings with positive restraint fasteners on wood ties, care must be taken to order material specifically designed to accommodate these fastening systems. The use of clips with corrosion prevention coating should be considered.

Prepared by: RMW

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

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

Central Florida Rail Corridor	Road Crossing Planning and Installation Checklist

PROJECT MILEPOST:_____ SUBDIVISION:_____

PROPOSED DATE OF INSTALLATION:_____

PROJECT PLANNING

Six (6) Weeks Prior To Project Work

___ Determine scope of project and crossings to be replaced with the Chief Engineer. Look for impediments such as drainage, utilities, and warning devices. Assess impact of raising track on roadway surface.

___ Review project scope, timeline, and who will furnish barricades with highway officials. Determine type of crossing surface. Same or different? Consider requests from local highway officials

___ Contact CFRC Maintenance of Way Manager to determine contribution by local agency

___ Order crossing materials necessary to complete road crossing project

___ Crossing material	___ Crossties	___ Spikes/screws/clips
___ Rail	___ Tie Plates	___ Ballast
___ Drainage material		

___ Notice of intent to contract (if applicable)

___ Contact agency responsible for road to arrange for road crossing closure.

___ Arrange for detour signing and barricading

___ Arrange for paving contractor or equipment for CFRC use to deliver and place asphalt in finished crossing

___ Arrange to have crossing saw cut and filled with ballast.

10 Days Prior SPT Team Arrival To Project

___ Review project work plan and time sensitive crossing due dates with Chief Engineer, when applicable.

1 Week Prior to Project Work

___ Review and re-confirm project scope, timeline, alternate routes and who will furbish barricades with highway officials.

___ Contact local 911 center, fire, police, ambulance, rescue, post office, school district, television and radio station, and newspapers to notify of the closure and planned duration.

___ Ensure dated crossing closure signs are placed onto crossings that serve as the only entrance and exits into a neighborhood, farm, industrial park etc.

___ Obtain emergency phone number for highway officials and local 911 Dispatchers.

___ Contact underground utility locator service (811) at least 48 hours prior to start of project.

___ Notify signal maintainer of work to arrange for necessary adjustment of equipment and removal/reinstallation of track connections.

___ Notify crossing renewal team of location, equipment required, and when to show up.

- ___ Backhoe
- ___ Dump Truck
- ___ Tamper
- ___ Asphalt placement equipment
- ___ Truck with hydraulic power unit
- ___ Hydraulic power tools
- ___ Regulator
- ___ Track stabilizer

___ Ensure that track time is arranged for the day prior to the crossing work

REMOVAL OF OLD CROSSING

___ Three days before planned closure, ensure all items in Project Planning are completed and their status is checked up.

___ Ensure that detour signing and barricading is in place

___ Ensure that track time is in place. 707 or authority is in effect. All warning signs are in place and that slow orders required are communicated to the dispatcher prior to taking the track.

___ If removing rail or replacing a panel:

- ___ Ensure that signal maintainer has removed track connections and disable warning devices
- ___ Cut rail
- ___ Lift or remove panel and move from immediate job site area

___ Clear out old ballast from crossing area for a 12” depth below crosstie or to hardpan depending on actual conditions.
___ Install HMA underlayment if required by project
___ Install geotextile fabric if required by project
___ Install drainage pipe if required by project
___ Pre-ballast panel area. Use vibratory roller to compact ballast.
___ Install panel (including 10 new approach ties both sides)
___ Fill in cribs
___ Tamp and regulate track. Run track stabilizer if present.

___ If replacing crossties:
___ Remove and reinstall the necessary number of crossties
___ Ensure that remaining crossties are in a new condition
___ Ensure that crossties are arranged and spiked pursuant to the new crossing material
___ Ensure that 4” of clean ballast is under each new tie
___ Fill in ballast around crossties.
___ Tamp and regulate track. Run track stabilizer if present.

___ Ensure track is inspected and safe for movement.

____ Ensure that applicable slow orders are in place.

___ Allow track to run appropriate amount of time/traffic to ensure consolidated ballast conditions.

REINSTALLATION OF ROAD CROSSING

____ Conduct a daily review of which crossing(s) are properly barricaded and scheduled for maintenance with crossing renewal team.

____ Install new road crossing material by following instructions for each type of road crossing.

____ Conduct a daily review of which crossing(s) have been serviced by crossing renewal team

____ Ensure crossing renewal team notifies paving contractor of which crossings need to be paved and have debris removed.

____ Restore asphalt pavement in and around road crossing
___ Ensure cribs are full of ballast. Compact ballast with vibratory equipment.
___ Ensure asphalt is at proper temperature at placement (>250ºF).
___ Place in lifts to not exceed 4 inches per lift for the base courses and not more than 2 inches for the wearing course.
___ Ensure proper vibrator roller is used during asphalt placement.
___ Ensure roller is operated parallel to the rails/crossing surface to ensure good compacting along edges of crossing.

____ Wait until asphalt is “hand cool” to open roadway for traffic.

____ Restore drainage away from the crossing zone.

____ Remove barricades and remove or cover all traffic control devices or detour signs.

____ Ensure track is inspected and safe for movement.

____ Ensure that applicable slow orders are in place.

____ Arrange for any track joints left in the track to be welded.

AFTER CROSSING IS COMPLETE

___ Ensure slow orders are not left on crossing an excessive amount of time.

___ Reclaim left over and released company material. Arrange for timely removal

___ Ensure that old asphalt is removed by paving contractor within 7 days of completion of road crossing.

___ Ensure that drainage in the crossing is not impeded by final cleanup work.

____ Contact local 911 center, fire, police, ambulance, rescue, post office, school district, television and radio station, and newspapers to notify them of crossing completion and re-opening it to public.

Specification 901A

Specifications for 9' Lagtype Shunt Resistant Concrete Grade Crossing Panels On 10' Timber Crossties

1. Each panel shall be manufactured using 6000 psi minimum concrete and American Grade 72 reinforcement. Manufacturer must supply mill certificates documenting reinforcement calculations, etc…

2. Each panel shall have a 3" x 3" x 1/4" angle surround. The angle surround shall have a 3 ml. rust inhibitive coating.

3. Each panel shall be manufactured to meet HS20-44 loading in accordance with AASHTO standard specifications for highway bridges, with a 30% impact increment. Loadings shall be based on single axle loads of 32,000 lbs. - 16,000 lbs. per side. Design calculations shall be certified by a registered professional engineer and submitted to owner, as requested.

4. Each panel shall have a non-skid surface and be protected from freeze/thaw cycles, deicers and other contaminants using 4 to 6 percent air entrainment.

5. Each gauge panel shall be 50-1/2" wide x 108" in length and manufactured to the correct height for size rail specified. Gauge panels shall have a 3" gap at each end of the frame with a non-conductive polyethylene insulator. The gauge panels at each end of the grade crossing shall have a deflector shield as depicted in the drawings.

6. Each field panel shall be 26 ¼" x 108" in length and manufactured for the correct height to size rail specified. The field panels at each end of the grade crossing shall have a deflector shield as depicted in the drawings.

7. Crossing panels shall be manufactured to be compatible with all rail fastening hardware and rail anchors.

8. Each field and gauge panel shall have recessed timber screw holes to protect timber screw heads from vehicular wheel impact as per locations specified in drawings.

9. Each panel shall have two (2) galvanized recessed lifting eyes with 4000 lbs. lifting capacity each. Each lifting eye shall be recessed below the surface of the panels to eliminate vehicular wheel impact.

10. Design of the crossing surface shall include provisions for filling in depressions and holes created by timber screws and lifting points. All depressions and holes shall be filled with a removable insert at all pedestrian crossings and within the limits of sidewalk on highway crossings. The removable insert shall be flush with crossing surface. Sand/grout type fill in depressions and holes will not be permitted.

11. Dimensional tolerance of grade crossing panels shall be +/- 1/4".

12. Each crossing shall be supplied with a 1/8" elastomeric bearing pad which shall be placed between the top of the crosstie and the bottom of the concrete panels.

13. If track is in a curve greater than 3°, panels shall be custom manufactured to fit radius. Use of filler plates will not be allowed and panels must abut one to the other. Manufacturer shall supply shop drawings detailing crosstie spacing and placement prior to installation

14. Any grade crossing panels which are located within the limits of a turnout shall be field measured and custom manufactured to fit. Manufacturer shall submit shop drawings within fourteen (14) working days after onsite field measurements are taken by manufacturer, indicating crosstie alignment and panel configuration prior to manufacture and installation.

15. At the owner's request, the supplier shall submit client references and shop drawings of the standard grade crossing panels for approval within fourteen (14) days after award of contract.

16. At a minimum the shop drawings shall include a full cross section view of panels on crossties, a plan view of panels in the track, and a detail drawing of the flangeways. The drawing should also indicate data on panel weights, loading specifications, lifting eye specifications and any other applicable information helpful to the engineer and/or client.

17. Manufacturer shall provide an onsite representative to assist at grade crossing installation, provided that notification of installation date is given well enough in advance (minimum two weeks) to allow scheduling.

18. Manufacturer must submit a copy of their Quality Assurance/ Quality Control Program. Manufacturer must batch/mix their own concrete. No ready mix concrete will be acceptable. Manufacturer QA/QC Program should address all areas in QA/QC of raw materials, production, curing, personnel training, testing, inspections, product tracking, shipping, standards and certifications, etc...

19. Manufacturer shall verify that they have been actively involved in the manufacture of full depth precast concrete grade crossings for a minimum of seven (7) years. Manufacturer shall have product that is being bid in service under heavy traffic, high tonnage with positive results for seven (7) years and supply verification upon engineer's request.

20. Manufacturer shall provide owner and engineer with a one (1) year manufacturer's limited warranty from date of delivery.

21. Manufacturer shall supply high resistivity elastomeric flangeway filler. Flangeway fillers shall meet ADA requirements.

PURPOSE:	To establish uniform instructions for the Use of Geotextiles and Geogrids.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, Local and CFRC Environmental Rules and Regulations. Care must be exercised when disposing of Geotextiles and Geogrids removed from the roadbed. Contaminated matting must be stages on plastic and covered with plastic. Contact local Environmental Specialist to arrange for proper disposal of soiled material.

I. DISCUSSION

Geotextiles

A. Geotextiles, also know as filter fabric, are permeable textiles manufactured from plastics in either woven or non-woven form. When used within the track structure, geotextiles have four potential functions: separation, transmission, filtration and reinforcement.

1. *Separation* provides a barrier to prevent subgrade fines from being pumped up into the ballast.

2. *Transmission* supplies a horizontal, lateral conduit to drain water away from the center of the track.

3. *Filtration* allows water to pass through the fabric while soil particles are retained.

4. *Reinforcement* produces additional tensile strength to distribute wheel loads over the roadbed. However, geogrids are the more appropriate material to perform this function.

B. Geotextiles will not correct line and surface problems caused by soft subgrade conditions. Geotextiles are neither a substitute for maintaining good roadbed drainage, nor a replacement for subballast in new construction.

C. Within the track structure, geotextiles can be an economical solution to problems caused by poorly drained ballast. Geotextiles may be installed at locations such as road crossings, turnouts, railroad crossings and insulated joints where wet subgrade and contaminated ballast have been a continuing or recurring problem. For new construction, geotextiles may be used if justified by unfavorable subgrade conditions.

D. Geotextiles may be used in earthwork, such as retaining structures and erosion control. Such applications must be designed and constructed on an individual basis and are not included in these instructions.

E. Geotextiles are not to be used to prevent contamination of the ballast from work activities, such as dumping fill material and digging close to the track. Black plastic is a more economical material for this purpose.

F. Geotextiles may deteriorate if continuously exposed to sunlight. Protection must be provided unless the material is scheduled for immediate use. It should be covered the same day it is placed. The original packaging should be retained to protect the remnants.

Geogrids

A. Geogrids are plastic sheets in the form of a grid having relatively large, uniform openings. The grids interlock with the soil to create tensile reinforcement.

B. Geogrids can be installed alone to strengthen the roadbed or in conjunction with geotextiles in severe service conditions where shallow stabilization is desired. For example, geogrids (with or without geotextiles) could be used at road crossings, turnouts, bridge approaches, railroad crossings, tunnels and tunnel approaches, retarders and sink areas.

II. PROCEDURE

Ordering Geotextiles

A. The guidelines for the selection of the weight of geotextiles follows:

1. Regular Duty (10 to 12 ounces per yard) is used for tangent track and light curves where drainage from the track is poor, but there is not a severe muddy or pumping problem.

2. Heavy Duty (12 to 16 ounces per yard) is used for heavy tonnage lines and any location where muddy, pumping track is a continuing problem.

3. Extra Heavy Duty (16 to 20 ounces per yard) is used for Railroad crossings, heavy traffic road crossings, bridge approaches and other extremely severe locations.

4. Turnout Packs, precut to fit the varying widths of turnouts and reinforced with extra thickness under the switch and frog areas, are available. These packs should be used to eliminate need to cut turnout sections from standard rolls.

B. Requisitions for geotextiles are to be submitted in the normal manner and must include the following information:

1. Service requirements:
Regular Duty, Heavy Duty, Extra Heavy Duty or Turnout.

2. Width required:
The normal width is 15'-0", but other widths can be obtained. Some mechanical placement systems used with undercutters use 11'-6" rolls.

3. Length required:
Rolls are normally manufactured in 300 ft. lengths, but may be ordered in other lengths. Include extra material to cover overlaps at the end of each roll. A 150 ft. roll of 12 ounce fabric 15'-0" wide has a gross weight of approximately 200 pounds.

4. Turnouts Packs:
State the frog number: 8, 10, 16 or 20. For number 16 turnouts, give the switch length: 24'-0" or 30'-0".

Ordering Geogrids

A. Requisitions for geogrids will be submitted in the normal manner.

B. The specifications for the geogrid must be based on the individual project requirements.

C. It is recommended that the manufacturer's representative be consulted to determine the proper geogrid for the installation.

Installation of Geotextiles

A. If underground cables are located in the work area, the proper agency must be notified. Communication companies, such as MCI, AT&T, US Sprint and Wiltel/WTG, the Signal Supervisor and/or other underground utility companies must be notified **prior** to installing geotextiles.

B. To function properly, the geotextile **must be installed correctly.** Four (4) basic requirements must be met:

1. Site Preparation
   For existing tracks, subgrade drainage must be directed away from the center line of track, and if possible, the low spots filled before placing the geotextile.
   For new construction, subgrade and subballast must be finished to the specified line and grade before placing the geotextile.

2. Depth
   To provide protection against damage from tamping and to avoid interference with future ballast undercutting/cleaning operations, the geotextile should be twelve inches (12") below the bottom of tie. The minimum depth to prevent puncturing by tamper feet is eight inches (8") below the bottom of tie. There must be at least an 8" separation between the ties and the geotextile before the track can be tamped. To accomplish this, the track must be raised on concrete blocks prior to unloading ballast. If long segments are to have geotextile material installed, ballast can be unloaded on the track section and power jacks can be used to raise the track to obtain the 8" separation prior to tamping.

3. Roadbed Drainage
   A means to carry water away from the geotextile must be provided. Where the roadbed section is not a fill section, parallel ditches at two feet (2') below the ballast section. (See Standard Drawing Number CFRC 2602) Where a geotextile is used through a road crossing, drainage structures parallel to the track must be installed. (See Standard Drawing Number CFRC 2611)

4. Overlapping
   To maintain continuity, a new roll of geotextile should be lapped approximately two feet (2') over the previous roll. Side overlaps should be approximately eighteen inches (18"). If sewing equipment is used, overlaps can be reduced by six inches (6").

C. Except for overlaps at roll boundaries, double layer of geotextiles must not be used because slip planes can develop between layers.

D. Inspect the work area and remove any sharp items which could snag or tear the geotextile.

E. Stretch the geotextile taut longitudinally and laterally before placing backfill.

F. Tamper operators should check the operation of their tamper after starting work and at regular intervals during the day ensure that holes are not being punched in the geotextiles. Holes will be repaired by removing the ballast and placing a piece of fabric over the hole. The fabric patch should overlap the hole approximately eighteen inches (18") on all sides.

Installation of Geogrids

A. Like geotextiles, geogrids **must be installed correctly** in order to function properly.

B. In general, the installation of geogrids is similar to the installation of geotextiles. (See Installation of Geotextiles above)

C. It is recommended that the manufacturer's representative be consulted to ensure that the installation plan, techniques and execution are proper.

III. REPORTS

None

Prepared by: RMW

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

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

Central Florida Rail Corridor

MWI 1101-05

Continuous Welded Rail Projects

Issued: 12/9/14
Revised: 10/9/14

PURPOSE:	To set instructions governing the Planning and Installation of CWR.
SAFETY:	Observe all applicable Safe Job Procedures and Safety Rules and Regulations.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, Local Environmental Rules and Regulations.
REFERENCES:	MWI 701 Use of Premium Rail Fasteners with CWR. MWI 702 Reclamation and Reuse of Track Spikes and Rail Anchors. MWI 703 Rail Anchoring Policy. MWI 901 Road Crossing Installation MWI 1125 Installation and Thermal Adjustment of CWR. CFRC 2512, 2513, 2514 Spiking Patterns.

I. DISCUSSION

A. The goal of this continuous welded rail policy is to ensure that the work meets all CFRC Standards as well as Engineering Department goals for safety, quality, and cost effectiveness. Because rail is laid in a wide variety of conditions, these instructions will define the process by which the agreed upon results can be obtained. The success of this process will require a coordinated effort from a team consisting of Officers including Transportation, Maintenance of Way, and Signal Departments.

B. Once the rail laying program has been established any changes after the program is finalized must be submitted through the change order process and have the approval of the Chief Engineer. The Chief Engineer shall notify the CFRC Maintenance of Way Manager of the changes to the rail laying program in writing.

C. The Chief Engineer will ensure that any revisions to the program or schedule are distributed.

II. PROCEDURE

A. PLANNING

1. The Chief Engineer will arrange a "pre-trip" meeting with appropriate personnel, a minimum of three months prior to the scheduled laying date of the welded rail, to inspect the work site, and to plan the work activity.

2. Personnel at the pre-trip meeting must include the Chief Engineer, CFRC Maintenance of Way Manager, Roadmaster, and a signal representative responsible for the maintenance of the track section on which the rail is to be laid.

3. This group will hi-rail the proposed rail laying site to determine what forces must do to prepare the track for welded rail, to validate the program and quantities of material required and to ensure this material is available for installation. This inspection should include identification of any rail determined to be suitable for reuse "self-help rail". Refer to MWI 508 for certified rail requirements.

4. If there is any item(s) on which agreement cannot be reached during the inspection, the representatives will jointly discuss the item(s) with the CFRC Maintenance of Way Manager for a decision. The decision made will be added to the inspection notes.

5. The Chief Engineer will attach the pre-trip packet mentioned in Paragraph B.2. (below) to the notes and forward copies to all individuals making the inspection for their review. The final packet will be distributed to at least the Chief Engineer, CFRC Maintenance of Way Manager, and the Roadmaster.

B. PRELIMINARY WORK

1. The Chief Engineer will advise the group of the method, equipment, and team that will be used to lay the rail. The Track Manager will maintain the inspection notes listing the work which needs to be done before the rail can be laid.

2. Track Manager will prepare a pre-trip packet of the project. Items to be included in the packet are but not limited to the following:

    a) Straight line sketch of the work area

b) Starting and ending locations.
c) Storage areas for released track material.
d) Identify rail for self-help and method of communicating this information to preclude errors by contractors or employees.
e) Equipment clearing and tie up points.
f) Road Crossings at grade: If to be worked, give locations, lengths, material to be used, and specific work details, including street name or DOT crossing number. (see MWI 901 for additional reference)
g) Turnouts to be replaced: Give size and hand, type of rail fastening system, power or hand operated, type frog to be installed, length of rail required for diverging side so compromise joints are off the switch ties, milepost location or name of switch. If panelized turnouts will be used, identify locations, methods of unloading and installation.
h) Railroad Crossings at grade: If to be replaced, give angle, type of crossing, tie condition, milepost location.
i) Indicate any special track or signal material to protect wayside equipment.
j) Identify the locations for insulated joints, compromise joints, and transition rails.
k) Identify the existing fastening system and the planned fastening system.
l) Locations using relay rail will use relay tie plates, when available. Relay tie plates may be used with new rail on tangent track with less than 25 MGT, when available.
m) Identify screw spike and lock spike (hairpins) locations.
n) Locations of recent curve patch, which do not meet the relay criteria, will be inspected and tie-in points identified.
o) Spot check of tie spacing in each mile to assist in ordering tie plates and anchors.
p) Bridge types and lengths. Standard Open Deck Bridge Tie Fastening must be complied with before welded rail can be laid across a bridge.
q) Tunnel locations and lengths. Arrange for lighting, ventilation, and air quality monitoring if required.
r) Locations at which special track material is required, and other items that may affect rail installation.
s) Indicate Bridge locations that require fall protection.
t) Prepare a local Emergency Response Plan including telephone numbers and highway directions to the nearest hospital or medical facility, police and fire departments, and rescue service.

3. The Track Manager and/or Roadmaster will be responsible for coordinating activities prior to the arrival of the rail laying team. This includes but is not limited to:

a) Preparing the list of track material required and ordering in accordance with current instructions.
b) Coordinating with appropriate Manager to ensure that materials arrive on time.
c) Performing any track work specified on the inspection notes.

d) Distributing track material as stated in the pre-trip packet.
e) Uniquely identifying rail approved for self-help.
f) Unloading rail from rail trains. Ribbons to be unloaded end to end but miss-matched, so that the rail ends cannot bind against each other.
g) Arrangements should be made to unload rail through road crossings. Unloading for turnouts should be accomplished with only one cut.
h) Discussing the proposed work and curfews with the local Transportation Officers to obtain the maximum possible track time.
i) Identifying high density road crossing areas, develop plan to assist rail team to maintain maximum productivity.
j) Coordinating the blocking of road crossings with state and local authorities.
k) Cutting bituminous concrete at road crossings beyond heads of ties to allow room for cribbing and adzing ties.
l) Monitoring the progress of work listed on the inspection notes.

4. The Bridge Manager will be responsible for:

a) Checking bridges to see that they comply with current instructions for laying welded rail and bringing them into compliance where necessary.
b) Providing the location of all bridges that require special handling before welded rail can be laid over them to the Chief Engineer.
c) Arranging for tunnel ventilation and/or lighting as needed.
d) Arranging for outriggers on bridges without sufficient width to support both the new rail being laid and the rail being removed.
e) Assist in any special needs for fall protection equipment or bridge specific systems.
f) Developing a fire prevention plan for open deck bridges to allow heating of the rail if rail temperature adjustment is necessary. Arrange for a water truck if necessary to protect bridge structures.

5. The Signal Manager will advise the Signal Maintenance Manager of any installations in the work area that do not conform to current signal standards and could be changed economically to the current Standard. Consideration should be given to scheduling Signal maintenance or construction activities at this time to take advantage of the curfew or track time given to the rail laying gang.

C. MATERIAL DISTRIBUTION PRIOR to ARRIVAL of TEAM

1. Production Teams use bulk delivery for much of the material needs to reduce double handling and eliminate waste. Those materials not handled bulk by the team need to be arranged for by the Track Manager working with the Roadmaster. Details of material distribution requirements follow:

a) Propane for rail heaters. Manager – Production Teams will advise Roadmaster of required amount.

b) Tie Plates, two (2) per tie right side up within the rails if plates are to be replaced. They must be placed along of the centerline of the track. One plate on the tie, one in the crib. Care must be taken to ensure that tie plates do NOT interfere with the Signal System. (bridging track circuit)
c) Compromise joints specific to the project will be supplied at the beginning of the project and unloading as designated in the pre-trip inspection. Joint bars must be available in case welding cannot be completed by the end of the day.
d) Rail anchors, spikes, screws, or Pandrol clips will be handled bulk through team supply chain.
e) Track bolts, nuts, and washers, will be handled bulk through team supply chain.
f) Tie plugging material or tie plugs will be handled bulk through team supply chain.

2. At specific locations within the rail laying area.

a) Distribute insulated joints and transition rails adjacent to their installation location
b) At turnout locations: Depending on the method of installation outlined in the pre-trip packet, the frog, switch points, stock rails, guard rails, etc., are to be turned in the proper direction for installation and unloaded as near as possible to the installation location.
c) At bridges: Tie pads for bridge ties.
d) At road crossings: Crossing material and hardware.

3. The track material distribution shown in Paragraph II.B. 1 – 3 above is based on typical CWR projects installed by production teams. If CWR is laid by division teams, material unloading may be adjusted, as needed, to accommodate specific project requirements and method of installation.

E. MATERIAL RELEASED from RAIL LAYING

1. Track material released from rail laying will be placed for pickup on the side of track away from the ballast line. Walkways and ditches must be kept clear. Do not place beneath overhead wire lines.

2. Tie plates will be placed apart from other material. If spikes, anchors, and joint bars are picked up separately during rail laying, they will be kept and loaded separately. If spikes, anchors and joint bars are picked up mixed during rail laying, they will be loaded mixed.

3. Empty gondolas will be arranged and spotted in an accessible location by the Roadmaster to be loaded with scrap OTM and scrap rail.

4. OTM and self-help rail should be clearly marked and discussed during the job briefing to ensure understanding by all parties. Contact Chief Engineer if there are any questions regarding self-help rail authority.

F. QUALITY CONTROL

1. The Chief Engineer or his designated representative will continuously monitor the quality of the work and ensure that all work is completed in a quality manner.

2. The Roadmaster and Track Manager will jointly hi-rail behind the team every week or for short rail lots, upon completion of the rail lot, to verify the quality of the work, the completeness of the project and to confirm that the plan is being followed.

3. The Track Manager will make frequent trips to the team and observe the quality of the work. Where practicable, the rail lot should be inspected by hi-rail with the Track Manager before the team leaves the rail laying location. This trip must occur with sufficient time before the team completes the project to allow for any corrective action to be taken prior to the team's departure from the project. If there is any question concerning any of the work underway or completed, they will immediately discuss with the Chief Engineer.

EMERGENCY RESPONSE PLAN

WORK LOCATION

Division: _____ Starting Date: _____

Subdivision: _____ Team Number: _____

Starting Milepost: _____ _____ Ending Milepost: _____ _____

EMERGENCY RESPONSE
DIRECTIONS FROM WORK LOCATION TO NEAREST MEDICAL FACILITY

_____

_____

_____

_____

_____

(Give highway exit numbers and other landmarks that will aid in finding the facility. Give mileage to the nearest tenth of a mile.)

EMERGENCY TELEPHONE NUMBERS

Rescue: (_____) _____ Name: _____

Police: (_____) _____ Name: _____

Fire: (_____) _____ Name: _____

CFRC Radio Channel for Dispatcher: _____

Chief Dispatcher: (_____) _____

Chief Engineer: (_____) _____

Roadmaster: (_____) _____

III. REPORTS

A. The Track Manager will ensure that the Daily Production Reports are input into the appropriate computer system in Maximo, 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.

B. Track Manager will prepare and forward the pre-trip packet as identified in Paragraph A.6 within one (1) week of the completion of the hi-rail trip.

C. Roadmaster will ensure that the rail laid and released in the CWR project is properly charged out in their inventory account within one (1) week after the rail team moves to the next project.

Prepared by: RMW

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

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

PURPOSE:	To establish uniform policy and procedures for out-of-face, smoothing and spot surfacing teams.
SAFETY:	Observe all applicable Safe Job Procedures and Safety Rules and Regulations.
LOCATION:	All CFRC maintained tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, Local Environmental Rules and Regulations.

I. DISCUSSION

A. The goal of this track surfacing policy is to ensure that the work meets or exceeds all CFRC and FRA Standards, as well as Engineering Department goals for safety and quality. Because surfacing work is done in a wide variety of conditions, these instructions will define the process by which agreed upon results can be obtained. The success of this process will require a coordinated effort from a team of Officers, which includes Transportation, Maintenance of Way, and Communications & Signal.

B. All surfacing operations must be performed in the proper sequence and in a uniform manner. Special attention must be placed on turnout, bridge, tunnel, crossing, and restricted clearance location work. It must be kept as close as possible to the general surfacing.

C. The track being worked will be protected by an appropriate temporary speed restriction during any period that it is not safe for authorized speed. Refer to *MWI 1109*.

D. Current instructions governing jointed and welded rail track maintenance in hot weather will be followed carefully. The Roadmaster will arrange to adjust rail, which requires adjustment by cutting, ahead of surfacing operation.

E. Muddy or fouled ballast locations should be cribbed or undercut in advance of surfacing operations where possible. The forces, as agreed upon in the planning meeting, will do this work. Ballast cleaning, if required, should be done in advance of the surfacing.

F. Switch timber or spot tie installations should be done in advance of the surfacing operation. The forces, as agreed upon in the planning meeting, will do these installations.

G. Road crossings are most efficiently re-worked during the Timbering Program. The surfacing program normally ties into the existing road crossings. Only those crossings, which have drainage or geometry defects, should be re-worked within the surfacing program.

H. Maintenance crews will completely surface all ties installed at the end of each workweek.

II. PROCEDURES

A. DISTRIBUTION OF BALLAST

1. When distributing ballast, care must be taken to control the flow of the material. The Roadmaster will ensure that the proper amount of ballast is unloaded, consistent with the required raise and the CFRC Standard Ballast Section (refer to standard drawing 2602).

2. Ballast will not be unloaded on open deck bridges, highway crossings, defect detectors, or other areas where it will damage equipment or interfere with operations. Special care must be taken to ensure that switches can be properly thrown. Sufficient ballast must be provided to do the diverging side of turnouts, ballast decked bridges, and approaches to open decked bridges.

3. When cars are discovered containing excess fines, or other non-standard materials, the employee in charge of unloading will inform the Roadmaster. The Roadmaster is responsible to see that the car number(s) are reported to the employee responsible for ballast cars.

4. Ballast unloading will be kept current with all surfacing operations.

B. SURFACING OPERATING

1. The Surfacing Team Supervisor/Foreman will determine the amount of track raise. The track raise will be based on the available ballast and the following criteria:

   a. The minimum height necessary to maintain proper profile, superelevation, and standard ballast section.

   b. Sufficient space under the tie to allow ballast to be inserted and compacted.

2. When more than one tamping machine is working in tandem, the foremen and operators must have a clear understanding concerning which ties each tamper will tamp.

3. When more than one tamping machine is working in adjacent areas, operators must have a clear understanding concerning the reference rail and runoffs made between tampers.

4. If a tamper malfunctions during surfacing operations in a manner that adversely affects the quality of the raising, aligning or ballast compaction, the following actions are required:

a. A temporary runoff of superelevation or track raise, appropriate to the temporary speed restriction, will be made.

b. The track will be protected by a temporary speed restriction, not exceeding 25 MPH.

Before this temporary speed restriction is removed, the entire limits of the affected area (including the entire curve) must be checked, and reworked if necessary, with a fully functioning tamper to ensure that the quality of the line and surface is consistent with CFRC Standards.

Some examples of applicable malfunctions are ineffective tamping tools, lifting, lining, or slewing component problems, as well as measurement and data system components problems, etc.

5. The foreman and operators will make inspections, on at least a daily basis or when the rail height changes, to ensure that tamping tools are maintained and adjusted as follows:

   a. All tamping tools must be in place and functional.

   b. Tamping tools should be adjusted so that the top of the tool pad is ½" below the bottom of the crosstie at full insertion.

   c. Tamping tools should be replaced when the tamping tool pad wears to a dimension of less than 1-3/4" high x 4" wide as measured on the smallest side.

   d. When changing tamping tools, the *tamping tool pad must not be struck with a hammer* due to the danger of metal chipping from the hardened surface of the pad. The tamping tool will be removed by the method recommended by the machine manufacturer.

   e. Special attention must be used when tamping concrete ties to ensure correct depth penetration is obtained. Failure to have correct depth penetration will result in damage to the ties if the tamping tool pads press against the side of the ties during the squeeze cycle. Also, care must be used to avoid unintended tie movement and damage to the concrete tie pads.

6. Surfacing operations on or near bridges, at tunnels, at overhead bridges or at other areas of restrictive clearance will conform to the following:

   a. Ballast section at the ends of bridges will be kept clean and well drained with ties fully supported at proper elevation to conform to that of the bridge.

   b. Tracks at ends of the bridges, trestles and through tunnels must be kept in good line and surface at all times.

c. The surface of track shall conform to the existing approach profile of open deck bridges and tunnels.

d. Standard ballast section must be maintained on ballast deck bridges. Therefore, the track shall not exceed an elevation that allows the top of ties to be more than:

1) Four (4) inches above the ballast curb on concrete bridges; or

2) Nine (9) inches above the timber ballast curb on timber bridges.

CAUTION: Ensure that materials do not fall onto roadways or into waterways.

e. There shall be no changes that reduce the clearance of tracks through tunnels without the prior approval of the CFRC Maintenance of Way Manager.

f. Tracks under overhead structures must not be raised to a height that reduces the minimum route clearance, without the prior approval of the CFRC Maintenance of Way Manager. In general, the clearance under each structure should be reviewed to ensure that future route clearance improvement projects would not be adversely impacted.

g. Track centers will not be reduced below the minimum route clearance during lining. The Chief Engineer or his designated representative will check restrictive locations in advance of the surfacing team. The track alignment on ballast deck bridges must not be changed without prior approval from the CFRC Maintenance of Way Manager.

7. Ballast will be pulled into shy areas as quickly as possible behind the tamping machine and before the end of the workday. Pulling fouled ballast into the ballast section is not permitted.

8. The foreman will make periodic inspections during ballast regulation operations to ensure that care is being taken:

a. Do not damage adjacent property, especially at highway underpasses.

b. Do not pull fouled ballast or other undesirable material into road crossings. The regulator should work away from the crossings whenever possible.

c. Do not damage rail fastening systems.

9. Special care must be taken to ensure that rail anchors within the work area are properly seated against the ties. In elastic fastener areas, ensure that missing fasteners are replaced. When the entire curve is worked, the completed project will comply with *MWI 1113.*

10. When a track stabilizer is used, a sufficient ballast section must be established before the stabilizer passes.

C. MAINTAINING CURVE GEOMETRY

1. Both vertical and horizontal curve geometry and superelevation will conform to CFRC Standards. Refer to *MWI 1104.*

2. The Chief Engineer will ensure that the Surfacing/Smoothing Team has an accurate copy of the *track charts,* that conforms to current CFRC Standards, before the work begins. He or a qualified designated employee will determine if advance curve measurement is required for the surfacing/smoothing work and furnish the information to the Surfacing/Smoothing Team.

3. The Foreman/Assistant Foreman, working with the surfacing unit, will mark the control points (TS, SC, CS, and ST) on all curves worked within out-of-face, smoothing, and spot surfacing projects with blue paint.

4. If the surfacing/smoothing work will be done utilizing a tamper equipped with a Computer Aided Geometry System (CAGS) or equal, the tamper can be used to measure the curves. The TS, SC, CS, and ST points will be located while tamping and marked by painting the inside and outside web of the rail blue. All curve data generated by the CAGS must be furnished to the Roadmaster before the surfacing team leaves the Roadmaster's territory.

5. If the surfacing/smoothing work will be done utilizing a tamper that is not equipped with CAGS or capable lining system, the starting and ending points of each curve can be located using a 62-foot chord. Data furnished from a Geometry Vehicle, which has a system that furnishes the information, should be used to determine the accuracy of existing records and if any advance work will be necessary prior to commencing the surfacing and lining operation. The TS, SC, CS, and ST points will be located and marked by painting the inside and outside web of the rail blue.

6. The following procedure will be followed to ensure that track stability is maintained on main and branch lines where:
   - the track is laid with continuous welded rail,
   - on curves one degree (1^{o}) or greater where the maximum authorized speed is 25 miles per hour or greater or on all curves greater than three degrees (3°),
   - and an expected rail temperature of 50° Fahrenheit or below within 24 hours of the work.

   Work during these conditions can create situations that lead to “adding” rail to the track, thereby affecting the track’s neutral temperature. The following procedures will assist in evaluating the track.

a) When the track is to be disturbed, the Roadmaster must ensure references are set at five or more locations before the work is performed. The references will be located at:
   - tangent to spiral (TS)
   - spiral to curve (SC)
   - mid point of the curve
   - within the body of the curve, as necessary,
   - curve to spiral (CS)
   - spiral to tangent (ST)

   The reference may be a fixed object or a 2" x 2" x 12" wood stake. They should be spaced no more than listed below if practicable:
   - 100 feet apart on curves 9^{o} and above
   - 200 feet apart on 4^{o} to 9^{o} curves
   - 400 feet apart on 2^{o} to 4^{o} curves
   - 800 feet apart on 1^{o} to 2^{o} curves

   and must be clear of maintenance activities. Do not place stakes at the ends of ties or in walking areas.

   Measurements should be taken from the field side head of the near rail to the face of the fixed object or the top near face of the stake. The tape used to make the measurement should not slope more than 1 vertical to 4 horizontal. A record of the reference stake location information will be furnished to the Roadmaster before the Surfacing or Smoothing Team leaves the territory. Use the *Curve Alignment Reference Form* that is included with this MWI to document this information.

b) During the work the rail temperature will be measured three times during the workday. The high and low temperatures will be recorded on the *Track Disturbance Record* and the report will be furnished to the Roadmaster. The measurements will be taken at the beginning, middle, and the end of the workday on the shady side of the rail web with an approved thermometer. The appropriate temperatures will be recorded on the Curve *Alignment Reference Form* and the *Track Disturbance Rail Addition Record* and the reports will be furnished to the Roadmaster. The *Track Disturbance Rail Addition Record* is to be furnished to the Roadmaster.

c) The Roadmaster or his designated representative will record the amount of movement periodically for up to 15 days after the work has been completed. If the curve moves inward more than an average of 1", a *Track Disturbance Rail Addition* record must be completed. The Roadmaster is responsible for remedial action prior to hot weather. Corrective action will be one or more of the following:
   - Place the curve on its original alignment.
   - Adjust the rail.
   - Place a temporary speed restriction not to exceed 25 MPH until one of the above is accomplished.

   Stakes, that could become a tripping hazard, should be removed as soon as possible.

7. Freshly surfaced track will require a temporary speed restriction. See *MWI 1109* for proper application of the temporary speed restriction.

D. FINISHED TRACK GEOMETRY

1. The minimum quality information shown below applies to out-of-face and smoothing teams. Teams with mechanical equipment must comply with *MWI 1113, Surfacing Section*.

2. The deviation from zero (0) cross level on tangent and designated elevation on curve will not be more than:

Track Class 1	½”
Track Class 2	½”
Track Classes 3 & 4	3/8"
Track Class 5	1/8"
Track Class 6	1/8"

3. The deviation from uniform profile (sags or humps) in 62 feet will not be more than:

Track Class 1	1"
Track Class 2	¾”
Track Classes 3 & 4	½”
Track Class 5	3/8’
Track Class 6	¼”

4. The deviation from proper alignment on spirals and curves at the midpoint of a 62 foot chord will not be more than:

Track Classes 1 & 2	1"
Track Classes 3 & 4	3/8"
Track Class 5	1/8"
Track Class 6	1/8"

5. Line swings at the end of spirals will not be permitted. Line swings on tangents which deviate from true line at the rate of more than one inch per hundred feet will not be permitted.

6. Rates of runoffs will be equal to or less than one (1) inch in 100 feet at the end of finished work.

7. Runoffs on the diverging portion of turnouts must be located off the long ties and must comply with paragraphs D 2, 3, and 4 above.

E. FINISHED BALLAST SECTION

1. The cross section of dressed ballast after compaction and expected settlement will have full cribs and shoulders that conform to the Standard Ballast Section. Refer to *CFRC Standard Drawing 2602*.

2. Excess ballast on the shoulder or in the track will not be permitted at highway and railroad crossing approaches, or defect detectors.

3. Excess ballast will be removed from bridge walkways, abutments and curbs, station platforms, and turnouts.

F. OTHER

1. Communication & Signal Equipment - Care must be taken during surfacing operations to avoid damage to wayside Communication & Signal equipment. When surfacing in and near defect detectors, refer to MWI 1121 for detailed procedures.

2. When surfacing switches, use care around snow melters. Do not damage equipment.

3. Road Crossings - Materials unloaded for use in reworking road crossings and materials removed from road crossings should be placed in a vacant quadrant of the crossing, where possible. These materials should be placed in a manner that will not interfere with the clear line of sight for a highway user or rail equipment operator, and will not interfere with the functioning of the road crossing control signal equipment. Care must be taken to maintain visibility, walking conditions and not impede drainage. Disposal of asphalt and other materials removed from the crossing will use a method consistent with CFRC environmental policy. See *MWI 901* for detailed road crossing information.

III. REPORTS

A. The Surfacing/Smoothing Team Supervisor/Foreman will ensure that:

1. Daily Production Reports are completed and submitted at the end of each production day,

2. Track Disturbance Record is completed daily and furnished to the Roadmaster at least weekly,

3. All curve data generated by the CAGS is furnished to the Roadmaster before the surfacing team leaves the Roadmaster's territory, and

4. A record of the reference stake location information will be furnished to the Roadmaster before the Surfacing/Smoothing Team leaves his territory. Use the *Curve Alignment Reference Form* that is included with this MWI to document this information. An Excel version of this form is also available.

B. The Chief Engineer will ensure that the *track charts* are updated within 30 days after completion of the work.

Prepared by: RMW

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

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

CURVE ALIGNMENT REFERENCE FORM

Division _____ Subdivision _____ Track _____ Deg Curve _____

Milepost: Prefix _____ Begin _____ End _____
Work Direction: (low to high MP) (high to low MP)
Type of Fasteners: (rail anchors) (Pandrol plates) (other _____)
Team No. _____ Team Type _____

DATE				
RAIL TEMPERATURE				
RECORDER				

NO	DESCRIPTION	MEASUREMENT 1 Before Work	MEASUREMENT 2 After Work	MEASUREMENT 3 Follow Up	MEASUREMENT 4 Follow Up

NOTES:
References should be marked fixed objects or wood stakes if practicable.
Number reference points in sequence in the direction of work.
In "Description", note TS, SC, CS, ST, and identify reference.
Measure from the field side of the near rail to the face of fixed object or stake. References should be spaced no more than:

- 100 feet on curves 9 degrees and above
- 200 feet on 9 degree to 4 degree curves
- 400 feet on 4 degree to 2 degree curves
- 800 feet on 2 degree to 1 degree curves

Reference stakes must be clear of maintenance activities, walking areas, and tie ends.

PURPOSE:	To establish the policy governing Temporary Speed Restrictions.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, Local Environmental Rules and Regulations.

I. DISCUSSION

A. Temporary Speed Restrictions are short duration speed reductions on specific segments of track. They are used when work activities or track conditions restrict the safe movement of trains at Timetable speed. For example, Temporary Speed Restrictions are required, but not limited to the following conditions:

1. Tracks that do not meet the CFRC or FRA Standards for the designated speed.

2. Tracks that are weakened due to construction or maintenance work on rail, ties, ballast, roadbed, structures, etc.

3. Tracks that are damaged by accidents.

4. Adverse or extreme weather conditions.

B. CFRC covers a large geographic area with varying climatic conditions. Chief Engineer and Roadmaster, and their responsible subordinates are more familiar than anyone else with the characteristics of the track structure and the weather conditions that occur on their respective territories. CFRC relies upon all employees to use good judgment at all times while implementing these instructions and ensuring that the track is properly protected.

II. PROCEDURES.

A. Placing Temporary Speed Restrictions

1. Contact the Train Dispatcher or Control Station and furnish the following information:
   - The Timetable Subdivision on which the temporary speed restriction is to be placed.
   - The Track Type Code of the track on which the restriction applies. The codes are shown on page 11 of this document.

- The speed(s) at which trains may operate. Give passenger train and then freight train speeds.
- The beginning prefix and milepost of the restriction (smaller number).
- The ending prefix and milepost of the restriction (larger number).
- Are Temporary Reduce Speed, End Restriction and Warning signs displayed? Yes/No
- The Engineering Reason Code for the restriction. (The codes are shown on page 12.)
- The initials of the employee issuing the temporary speed restriction.

The temporary speed restriction is effective only after the Train Dispatcher repeats the information and the message number is assigned.

2. Employees that issue temporary speed restrictions should have a copy of the current speed restrictions for the Subdivision to ensure that overlapping milepost limits are not requested.

3. Limits of temporary speed restrictions should be extended, where necessary, to avoid heavy braking on sharp curves, bridges, bridge approaches and recently disturbed track.

4. If there are locations requiring temporary speed restrictions separated by short sections of track, it may be advisable to include them within a single speed restriction. The best course of action will depend on the geography and train operation. Items to consider are:
   - Length of time restrictions will be on.
   - Difference between timetable speed and restricted speed.
   - Type of train operation (passenger vs. heavy freight).
   - Train delay – Short trains can take advantage of space between speed restrictions while long ones may not.
   - Curvature / grade and resulting dynamic action from acceleration and braking.
   - Possible train crew confusion interpreting temporary speed restriction signs when restrictions overlap or are within 2 miles of each other.

   Good judgment is needed to optimize speed restriction placement.

5. The temporary speed restriction should be the highest speed at which a train may safely pass over the restriction. Speeds of 10 MPH, 25 MPH and over, with increasing increments of 5 MPH may be used when placing the restriction. Speeds between 10 and 25 MPH must not be used on jointed rail track due to harmonic rocking of cars.

6. Temporary speed restriction signs (Standard Drawing 2724) will be placed in accordance per the Operating Rules. If speed restriction will remain on track over night, the signs must be installed.

7. Temporary speed restrictions may cause problems on curves due to trains moving at

speeds below the design speed. The superelevation in these curves tends to increase due to the additional weight on the low rail. Also this unloading of the high rail can lead to wheel climb or lift, especially if the alignment is irregular. The curve should be checked periodically in the vicinity of the temporary speed restriction to detect these and other undesirable conditions.

8. When track is being worked and it is known that it will be opened to traffic with a speed restriction, inform the dispatcher as soon as possible.

9. The Roadmaster should be notified immediately of any temporary speed restriction placed on his territory. The notification should contain, as a minimum the location, the nature of the problem, and an estimate of the material, labor, and time required to repair the track.

10. General Bulletins may be used for temporary speed restrictions if the track conditions or repairs will take an extended period of time (over 30 days) to correct or complete. Obtain concurrence from the Chief Engineer. The request will contain the information identified in paragraph II.A.1.above.

B. Removing Temporary Speed Restrictions

1. Priority in removing temporary speed restrictions should be given to those that cause train-handling difficulties. Speed restrictions placed at isolated or individual locations should be given priority for removal over other locations where a series or group of temporary speed restrictions exist in a relatively short distance.

2. The Roadmaster or designee should remove temporary speed restrictions placed by Engineering Department personnel, after inspection, and as soon as possible.

3. After being advised the restriction is no longer required, the Train Dispatcher will remove the temporary speed restriction.

4. The Engineering Employees removing a temporary speed restriction should have a current copy of the Dispatcher bulletin for the territory in his possession to ensure that gaps in restrictions are not created.

5. The Chief Engineer will initiate the request to the Division Manager to cancel a General Bulletin containing a temporary speed restriction. The Engineering Department Supervisory Employee-in-Charge must notify the Chief Engineer that the track condition has been corrected or the work completed and the restriction is no longer required before he can initiate the request to cancel the General Bulletin.

6. Signs associated with the Temporary Speed Restriction must be removed in conjunction with the removal of the temporary speed restriction. If this is not accomplished, trains will comply with the appropriate operating rules and experience unnecessary delay.

C. Tracks Not in Compliance with CFRC or FRA Standards

1. If a segment of track does not meet all the requirements set by CFRC or FRA, the maximum authorized speed will be reduced to the speed at which it is in compliance.

2. Placing temporary speed restrictions on tracks inspected by Rail Test, GMS/TGC, and Gage/Cross level vehicles are covered in the following MWI's:
   - MWI 501 - Remedial Action for Defects Identified by Rail Test Cars
   - MWI 1102 - Geometry Measurement System Car (GMS) Operations
   - MWI 1106 - Geometry Truck Operation
   - MWI 1111 - Track Geometry Car (TGC) Operations

D. Tracks under Repair

1. Guidelines for Temporary Speed Restrictions are given in the Chart *"Required Actions for Preventing Track Buckling"* which is included in this MWI.

2. Speed through a work area will be reduced, as necessary, to protect the employees making the repairs and the train traffic in the work area.

3. The Employee In Charge of the work will follow procedures given in the Operating Rules and On-Track Safety Rules when providing protection for employees and train traffic.

4. A temporary speed restriction will be placed on all tracks under repair when ballast is insufficient to maintain track stability. After the ballast section has been restored, removal of the temporary speed restriction will be governed by instructions specified in the Chart *"Required Actions for Preventing Track Buckling"* dated the same as this MWI. This current chart is also included in the CFRC *Engineering Field Manual*. (Additional information is provided in Part 7, Track Buckling Prevention Guidelines in the *Field Manual*.)

5. The Roadmaster will maintain completed *Track Disturbance Reports* where the integrity of the track structure has been disturbed.

E. Track Damaged by Accident

1. A train accident or emergency brake application may cause severe damage to track and roadbed. A track on rebuilt roadbed will take longer to stabilize than one that has been shifted on an existing roadbed. The length of time that a temporary speed restriction must remain in effect depends upon the unique conditions at each incident.

2. If the track is damaged to the extent that five (5) or more ties per 39 ft. are replaced or track panels are installed, a 10 MPH temporary speed restriction will be placed on the first train over the damaged track segment. Prior to the second train, a walking inspection will be made of the track. The inspector will be looking for changes in

alignment and surface caused by the passage of the first train. After any necessary track repairs have been completed and the ballast section is sufficient to maintain track stability, then:

a. If rail temperature is less than 110°F, speed will not exceed 25 MPH (See c).

b. If rail temperature is 110° F or higher, at least two (2) tonnage trains will be operated at 10 MPH. The 10 MPH restriction will continue until rail temperature has dropped below 110° F (See c).

c. Depending on the work performed, further removal of the temporary speed restriction will be governed by the instructions specified in the Chart *"Required Actions for Preventing Track Buckling"* dated the same as this MWI.

F. Hot Weather Conditions

1. Temperature criteria:

a. *Hot Weather* is defined as an ambient temperature of 85° F or higher or rail temperature 110° F or higher.

b. *Significantly Increasing Temperature* is defined as ambient temperature fluctuations that occur primarily in the spring of the year where the temperature may change in excess of 40°F from night to mid-day.

2. CWR and tight jointed rail will be inspected daily on *Hot Weather* days or during periods of *significantly increasing temperature*. This is especially important if a temporary speed restriction has been placed because of potential buckling. Inspect between 1200 and 1800 hours. Track not properly maintained during cold weather may buckle during a period of widely fluctuating temperatures or on the first warm spring days.

3. *Hot Weather Inspections* may be lessened or suspended after temperatures have stabilized and previous inspections have shown that the track structure is sound and complies with standards.

4. When in doubt about the temperature, inspect your track. This is especially important on weekends and holidays.

5. Roadmasters must be familiar with the potential problem areas on their territory. They will ensure that these locations are given priority in carrying out these inspections to safeguard their territory.

6. Track, which IS NOT in compliance with the CFRC standards for rail adjustment, ballast section and rail anchor pattern, may require a temporary speed restriction due to *Hot Weather*. Refer to the *Track Buckling Prevention Guidelines* section of the *Engineering Field Manual* for more information.

7. Where track and operating conditions warrant, the following should apply:

   During extended periods of high temperature or extreme daily fluctuations, it is the responsibility of the Chief Engineer or his designee to identify these locations and have a train message issued per CFRC operating rule 301.6, Heat Warning when required based on track and train conditions.

   The following criteria govern the implementation of a Heat Warning dispatcher message:

   a. *Extended Periods of High Temperature* is consecutive days exceeding:
      i. 90 degrees north of Pierson, Florida, and Ocala, Florida, or
      ii. 95 degrees south the aforementioned locations.

   b. *Extreme Daily Fluctuation* is a daily change of 40 degrees or more.

   c. If the restriction is to be listed as milepost segments, that information must be issued to the Operations Center by 2100 hours the day before it is to go into effect.

   d. Heat Warning will remain in effect until canceled.

   e. If actual weather conditions vary from forecast conditions and a Heat Warning is not warranted, it must be canceled with the Operation Center as soon as possible.

   f. The Chief Engineer may suspend the use of this Heat Warning after the temperatures have stabilized and previous inspections have shown that the track structure is sound and complies with the Standards.

G. All Weather Conditions

1. Temporary speed restrictions must be used to protect the following work operations, which normally do not require cutting rail. The chart in the back of this instruction defines the required actions. This information is also shown, in more detail, in Part 7 of the *Engineering Field Manual*.
   • Crosstie and switch tie replacement
   • Grade crossing renewal
   • Spot surfacing, spot cribbing or smoothing
   • Surfacing out of face or at a bridge approach
   • Shoulder ballast cleaning
   • Spot undercutting and undercutting out of face
   • Bridge work

2. Temporary speed restrictions must be used to protect the following work operations, which normally require cutting the rail. The chart in the back of this instruction defines the required actions. This information is also shown, in more detail, in the *Engineering Field Manual*.

Whether the rail has been adjusted to CFRC standards or not **and** one or more of the following activities have disturbed the stability of the track structure:

- Where rail length has been increased due to repairs of pull-aparts, broken rails, defective rails or rail joint removals
- Curves that have chorded or moved inward due to maintenance work or cold weather
- Turnout or road crossing installation
- Track panel installation
- Rail laying out of face
- Curve patch rail
- Transposing welded rail
- Any other work that would reduce the adjusted rail temperature below the temperature specified for that location in MWI 1125

A report must be made (see item 3 below).

3. When any of the activities or conditions identified in sections II.G.1. & II.G.2. are performed, regardless of rail temperature, a *Track Disturbance Report* (see page 13) must be completed. Input the information into the Track Disturbance Management System in the Engineering Gateway. The *Track Disturbance Report* should be reviewed periodically to ensure that temporary speed restrictions are placed when temperature conditions warrant.

4. If the maintenance is rail or joint repair, a *Pull Apart and Rail Repair Reporting Form* should be used to collect proper information to input into system. See page 14 for a sample of this form.

5. The Roadmaster will submit a *Buckled Track Report* (see page 15) for all incidences of heat caused lateral track displacements except those occurring during the time the track is being worked. In work areas, lateral movements occurring after the days work activities have been completed or under a train passing through the work area must be reported.

H. Cold Weather Conditions

1. On main tracks, cold weather inspections must be performed as directed by the Roadmaster when the ambient temperature is forecast to drop to 0°F or below. Temporary speed restrictions will be set by the Chief Engineer or his designee. Removal of the temporary speed restriction will be at the discretion of the Chief Engineer or his designee.

2. Inspect for:
    - Broken rails
    - Broken or cracked joint bars (Conventional and Insulated)
    - Pull-aparts
    - Broken and bent bolts

- Wide gap between rail ends
- Curve movement
- Canted rail

Subsequent inspections should be made as required by track conditions and consideration of non-signaled territory.

3. The Roadmaster will maintain a current list of and pay special attention to locations with substandard anchor patterns so that inspections and temporary speed restrictions can be issued when required.

I. Strong Wind Weather Conditions

Tracks are not usually damaged by strong winds to the extent that temporary speed restrictions are required. However, temporary speed restrictions or "look out" orders should be issued for areas where wind has caused problems in the past and it is not possible to inspect the track prior to train operations. The speed reductions should be tailored to the severity of the previous problems. Temporary speed restrictions will be removed as soon as the problem has been corrected.

J. Heavy Rain and Flash Flooding Weather Conditions

1. Rainfall can produce large quantities of water that can cause track damage:
   - by washing out bridges, pipelines, roadbed and ballast,
   - by slides and rock falls onto the track, and
   - by making the track impassable from flooding.

   The tracks should be inspected as necessary. In some areas, portions of track will be flooded while other portions are not. If the track is accessible, it should be inspected while waiting for the water to recede.

2. Temporary speed restrictions will be placed on specific segments of track that are known to be susceptible to drainage, flood, and/or slide problems. The speed reduction should be consistent with the severity of the conditions. It may be necessary to take a track out of service if high water prevents visual inspection of roadbed in areas that are known to have scouring problems. Temporary speed restrictions should be removed as soon as possible after the track structure has been repaired and the roadbed has stabilized.

3. A list of all locations vulnerable to drainage, flood, and/or slide problems will be maintained at the Roadmaster and Chief Engineer levels so that problem areas can be quickly identified and proper track protection implemented as weather conditions dictate. This list must be reviewed/updated on an annual basis.

4. There are three (3) types of rainfall/flooding alerts, which require specific actions to protect the track. They are Rising Water Warnings, Flash Flood Watches, and Flash

Flood Warnings. Refer to MWI 1110 for details.

K. Hurricanes, Tornadoes, and other Severe Storms

1. Request should be made to take track sections, reported to have been subjected to hurricanes, tornadoes, and other severe storms out of service and an immediate on-the-ground inspection conducted.

2. Based upon this inspection, damages will be identified and prioritized and the appropriate temporary speed restrictions and/or look out orders covering the specific track sections implemented before restoring the track to service. The temporary speed restrictions will be removed as soon as possible after the damage has been repaired and inspected.

L. Heavy Snowfall

1. Normal snowfall without strong winds should not inhibit the safe operation of trains at maximum authorized speed. Heavy snowfall coupled with strong winds can result in severe drifting in cuts, side hill cuts and wooded areas. Often inspections by hi-rail vehicle are impossible due to the vehicle becoming bogged down. In these circumstances, inspection is best done riding a train. Road crossings should be checked and cleared of ice and snow left by highway snowplows. Thawing, freezing and crusting of heavy snow accumulations may require the use of plows or spreaders ahead of trains.

2. The Roadmaster must maintain an updated list of all locations on his territory that are subject to severe drifting. This will enable him to expeditiously issue the appropriate temporary speed restrictions for the existing snowfall conditions.

M. Earthquake Response

1. When an earthquake is detected depending on the magnitude, there are certain inspection requirements to ensure the safe operations of trains. Refer to MWI 1126 for details.

III. REPORTS

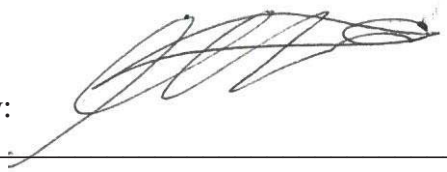
1. Sample of *"Track Disturbance Report"* from Gateway, page 13

2. Copy of "*Pull Apart and Rail Repair Reporting Form", page* 14

3. Copy of *"Buckled Track Report"*, page 15

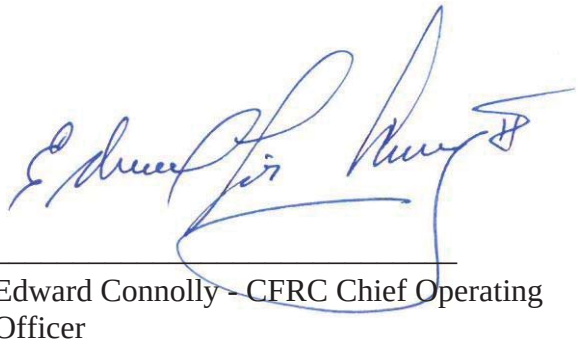
4. "*Required Actions for Preventing Track Buckling"*, pages 16 to 18.

Prepared by: RMW

Reviewed by: 

_____

Gerry Woods - CFRC Maintenance of Way Manager

Approved by: 

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Edward Connolly - CFRC Chief Operating Officer

CFRC

CFRC

TRACK TYPE CODES

Code	Dispatcher Bulletin	Code	Dispatcher Bulletin
M	MAIN	NEW	NE WYE
S	SIDING	NL	NORTH LEAD
1	NO 1	NS	NORTH SDG
2	NO 2	NW	NORTH WYE
3	NO 3	NWW	NW WYE
4	NO 4	NY	NORTH YARD
BL	BRNCH LEAD	P	PLATFORM
BP	BYPASS MN	PAS	PASS
C	CENTER SDG	PL	PSSGR LEAD
CO	CUTOFF	PM	PSGER MAIN
CT	CONNECTION	POC	POCKET
D	DRILL	P1	PLATFM NO1
EDR	EAST DRILL	P2	PLATFM NO2
ES	EAST SDG	RUN	RUNNING
EWY	EAST WYE	SCL	SCALE
EXT	EXTENSION	SEC	SECONDARY
EY	EAST YARD	SEW	SE WYE
FL	FRGHT LEAD	SL	SOUTH LEAD
FM	FRGHT MAIN	SPR	SPUR
HSE	HOUSE	SS	SOUTH SDG
IL	INTERLOCK	STO	STORAGE
IND	INDUSTRIAL	SW	SOUTH WYE
INL	INDU LEAD	SWW	SW WYE
INT	INTERCHNGE	SY	SOUTH YARD
LL	LONG LEAD	T	TURNOUT
MA1	MARC NO 1	WDR	WEST DRILL
MA2	MARC NO 2	WS	WEST SDG
MA3	MARC NO 3	WWY	WEST WYE
ML	MARC LEAD	Y	YARD

CFRC
TEMPORARY SPEED RESTRICTION REASON CODES

Code	*Reason*
	Working
101	Undercutter
102	Ballast Cleaner
120	Rail Team on Track
121	Continuous Welded Rail Not Surfaced
130	Timbering
131	Timbering Not Surfaced
140	Surfacing
141	Running Time - Ballast Compaction
150	Roadbed Stabilization
160	Bridge Construction
161	Bridge Tie Installation
171	Turnout Work
172	Road Crossing Work
173	Construction
	Rail
201	Rail Test Car Detected Rail Defects
202	Joint Condition
203	Surface Bent
204	Temperature Condition
205	Gage Account Rail Condition
206	All Other Rail Defects
207	Insufficient Rail Anchors
	Timber
300	Poor Timber
301	Gage Account Tie Condition
390	Poor Timber – Geometry Car
391	Gage – Geometry Car

Code	*Reason*
	Surface
401	Cross Level And Warp
402	Alignment
403	Excessive Elevation
404	Insufficient Elevation
405	Gage Account Surface Condition
406	Insufficient Ballast
491	Crosslevel & Warp – Geometry Car
492	Alignment – Geometry Car
493	Excessive Elevation – Geometry Car
494	Insufficient Elevation – Geometry Car
	Roadbed
501	Unstable Roadbed
	Bridge
601	Bridge Maintenance Superstructure
602	Bridge Maintenance Substructure
	Other track
701	Turnout Condition
702	Highway Crossing
703	Rail Crossing
704	Derailment
705	Geometric Conditions
706	Highway Crossing Warning System
	Other
099	Other

CFRC
Pull Apart and Rail Repair Reporting Form

1. **Employee Name**:_____**ID#**_____
2. **Division:**_____**Subdivision**:_____
3. **Type of repair:** (Pull Apart) (Rail Repair) (Joint Bars) circle one
4. **Date**:_____**Rail side (facing increasing milepost)** L R
5. **Milepost (w/prefix)**:_____Track Single 1 2 3 4
   Siding Yard Crossover
6. **Weight of rail (lb)**:_____**Alignment:** Tangent High Low
7. **Rail Type**: CWR Jointed Turnout/ Special Trackwork
8. **Bolts Sheared** Y N **Joint Bar Length** 6 hole 4 hole
9. **Ballast Standard** Y N **Frozen** Y N
10. **Number of Bolts Sheared** 0 1 2 3 4
11. **Distance pulled apart, gap (inches)**:_____
12. **Measurement before cut** ____ **FT** ____ **INCH** _____ **FRACTION**
13. **Measurement after cut** ____ **FT** ____ **INCH** _____ **FRACTION**
14. **Time of repair:**_____ **Rail Temp(ºF)**:_____ **Ambient Temp(ºF)**:_____
15. **Designated Rail Laying Temperature(ºF)**:_____
16. **Estimated RNT before break/pull apart (ºF):**_____ (see page 2)
17. **Anchor Pattern at pull apart**: Every other tie Every Tie Other
18. **Anchor condition:** _____
19. **Anchor or Clip**: E Clip on Concrete E Clip on Wood Fastclip on Concrete Other
20. **Corrective Action:**_____ **Corrected:** Y N
21. **Comments**:_____
22. **Remedial Action**:_____ **Speed:**_____
23. **Joints:** Added Eliminated Neither **Numbe**r:_____
24. **Rail**: Added Subtracted None **Inches**:_____**Permanent** Y N
25. **Entered into system**: Y N **Date**:_____

CFRC
Central Florida Rail Corridor

BUCKLED TRACK REPORT

THE PRIMARY CAUSE FOR THE BUCKLE IS TO BE CHECKED. THE NORMAL METHODS OF CORRECTION TO PREVENT RECURRENCE ARE GIVEN TO THE RIGHT OF THE CAUSE. CHECK ALL CORRECTION BOXES FOR CORRECTIVE ACTION TAKEN. FOR EXAMPLE, A BUCKLE CAUSED BY A LINE DEVIATION WAS CORRECTED BY LINING AND THEN DRESSING THE DISTURBED BALLAST TO THE STANDARD SECTION.

LOCATION

DIVISION

TIMETABLE SUBDIVISION

PREFIX

MILEPOST

TRACK NUMBER

DATE BUCKLED

TIME BUCKLED (24 HOUR CLOCK)

RAIL TEMPERATURE AT TIME OF BUCKLE

RAIL TEMPERATURE WHEN CORRECTED

ALIGNMENT
☐ TANGENT
☐ CURVE - DEGREE =

LINE CORRECTED ON
BY ☐ HAND ☐ MACHINE

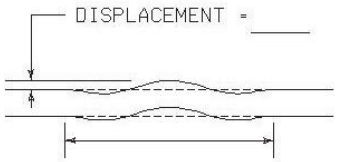
SURFACE CORRECTED ON
BY ☐ HAND ☐ MACHINE

DID BUCKLE CAUSE A DERAILMENT
☐ YES ☐ NO

IF YES, GIVE ACCIDENT NUMBER

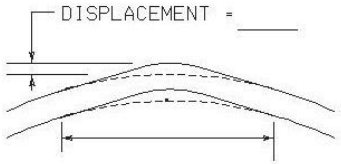
SKETCH THE BUCKLE

TANGENT TRACK.



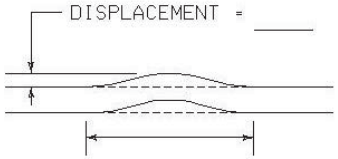
LENGTH = _____

CURVED TRACK.



LENGTH = _____

OTHER.



LENGTH = _____

CAUSE

☐ LIGHT BALLAST SECTION BEFORE BUCKLE.
LEVEL DISTANCE FROM END OF TIE TO SHOULDER WAS _____'. CRIB WAS
☐ EVEN WITH TOP OF TIE.
☐ _____" BELOW TOP OF TIE.
☐ NON-STANDARD BALLAST SECTION (DESCRIBE).
_____
_____

☐ LOOSE ANCHORS (NOT TIGHT AGAINST TIE).
☐ LOOSE ANCHORS (RAIL MOVED THRU ANCHOR).
☐ INSUFFICIENT NUMBER OF ANCHORS.
☐ NON-STANDARD ANCHOR PATTERN (DESCRIBE)
_____
_____

TRACK RECENTLY DISTURBED: DATE
☐ RAIL PATCHING ON _____
☐ TRACK PANELS INSTALLED _____
☐ TIES INSTALLED _____
☐ SURFACED OUT OF FACE _____
☐ SPOT SURFACE/SMOOTHING _____
☐ CRIBBING/SPOT UNDERCUTTING _____
☐ OTHER _____ _____

RAIL NOT PROPERLY ADJUSTED:
☐ RAIL LAID _____ AT _____ ° F
(RAIL TEMPERATURE) AND NOT ADJUSTED.
☐ RAIL REPLACED _____ AT _____ ° F
(RAIL TEMPERATURE)

☐ OTHER (DESCRIBE) _____
_____
_____
_____
_____

CORRECTION

☐ BALLAST ADDED AND/OR DRESSED ON _____.
BALLAST NOW EXTENDS _____' BEYOND TIE ON TANGENT AND _____' ON CURVES (HIGH SIDE).

☐ ANCHORS TIGHTENED AGAINST TIE.
☐ ANCHORS APPLIED ON _____ USING PATTERN:
☐ BOXED EVERY TIE. ☐ BOXED ALTERNATE TIES.
☐ OTHER (DESCRIBE)
_____
_____

☐ SPEED RESTRICTION _____ MPH FOR _____ DAYS TO STABILIZE TRACK. REMOVED ON _____.
NUMBER OF TRAINS OVER THIS LOCATION AT REDUCED SPEED : _____.
TONNAGE AT REDUCED SPEED = _____.

☐ RAIL ADJUSTED ON _____ _____ TO ° F
(RAIL TEMPERATURE).
REMOVED _____" FROM NORTH OR WEST RAIL.
REMOVED _____" FROM SOUTH OR EAST RAIL.

☐ OTHER (DESCRIBE) _____
_____
_____
_____
_____

REMARKS _____
_____
_____

SUBMITTED BY _____ TITLE _____

HEADQUARTERS _____ DATE _____

COPIES TO CHIEF ENGINEER-MOW & DIVISION ENGINEER

DESIGN FILE: MWI1109.DGN REVISED 5/4/05

CFRC REQUIRED ACTIONS FOR PREVENTING TRACK BUCKLING	Temperature Criteria			Actions								Field Manual cross-reference
Existing Condition and General Notes	Any ambient temperature	85 °F ambient or higher	Temperature increasing significantly	10 MPH until ballast is made sufficient	10 MPH until adjusted by cutting or lining and anchors and ballast section are made sufficient to maintain track stability	10 MPH for 2 tonnage trains AND rail temperature has dropped below 110 °F	Maximum of 25 MPH until condition is corrected	25 MPH for 10 tonnage trains, in effect until at least 2100 hours the day the tonnage	Further speed restrictions may be necessary dependent on amount of displacement	Inspect every day	Make additional inspections as required	
Track Inspection		●	●								●	7.4
Temporary speed restriction has been placed to protect against track buckling	●									●		7.4
Insufficient ballast to maintain track stability		●		●								7.8.1
Insufficient anchor pattern		●					●					7.8.2
Track not being worked becomes misaligned due to heat	●				●	●		●				7.5.2 7.5.4
Curve not worked shifts inward more than an average of 1"			●				●		●			7.5.2 7.9.5
Greater than 1" of rail added that has not been adjusted		●	●				●					7.5.3

Notes

For ballast compaction, accumulated tonnage may be used if information is available. A Tonnage Train is defined as a train consisting of at least 5,000 gross tons. (Example: 10 Tonnage Trains = 50,000 tons, 2 tonnage trains = 10,000 tons, etc.)

19 passener trains = 1 tonnage train

The track must be inspected before any speed restriction is changed or removed.

Submit Track Disturbance Report for all track work listed.

Note 1: If ties are installed during spot maintenance work when rail temperature is expected to be 110° or greater, a tamper must be used or rail cut and adjusted

Note 2: The track in Turnout Zone must be surfaced with a tamper or rail cut and adjusted on the day of tie installation.

Note 3: If rail is added at any time or temperature within the Turnout Zone, a 25 mph speed restriction must be placed until rail is adjus

CFRC

REQUIRED ACTIONS FOR PREVENTING TRACK BUCKLING

Track Maintenance Work when Rail Temperature is **Less Than 110 °F**	Actions										Field Manual cross-reference
	10 MPH until ballast is made sufficient to maintain track stability	10 MPH for 1 tonnage train	Maximum of 25 MPH until ballast is made sufficient to maintain track stability	25 MPH for 1 day	25 MPH for 10 tonnage trains	25 MPH for 5 tonnage trains	25 MPH for 2 tonnage trains	25 MPH for 1 tonnage train	50 MPH for 10 tonnage train	50 MPH for 5 tonnage train	
	If rail temperature reaches 110 °F or greater, AFTER work is complete, speed restriction stays in effect until 2100 hours on the day tonnage requirement is met.										
Spot ties - Replace up to 4 ties/39' rail length or 3 of 4 consecutive ties - High tonnage tracks			●				●				7.8.11 A
Spot ties - Replace up to 4 ties/39' rail length or 3 of 4 consecutive ties - Other tracks			●				●				7.8.11 A
Tie & Surfacing or replace 5 or more ties/39' rail length or renewing a grade x-ing - High Tonnage Tracks			●		●				●		7.8.12 A
Tie & Surfacing or replace 5 or more ties/39' rail length or renewing a grade x-ing - Other Tracks			●			●				●	7.8.12 A
Tie & Surfacing with use of a dynamic track stabilizer			●				●				7.8.22 A
Spot Surfacing or Spot Cribbing - an area of 5 ties or less - High Tonnage Tracks			●				●				7.8.13 A
Spot Surfacing or Spot Cribbing - an area of 5 ties or less - Other Tracks			●				●				7.8.13 A
Surfacing out-of-face, smoothing, or surfacing a bridge approach - High Tonnage Tracks			●		●					●	7.8.14 A
Surfacing out-of-face, smoothing, or surfacing a bridge approach - Other Tracks			●			●				●	7.8.14 A
Surfacing a sink, slip or roadbed stabilization problem area - All Tracks	Refer to chart for track maintenance work when rail temperature is 110 °F or greater										7.8.15
Surfacing with use of a dynamic track stabilizer			●					●			7.8.21 A
Shoulder Ballast Cleaning			●				●				7.8.16 A
Track Undercutting Surfaced - All Tracks	Refer to chart for track maintenance work when rail temperature is 110 °F or greater										7.8.17
Track Undercutting Surfaced with use of a dynamic track stabilizer	●	●		●							7.8.23 A
Laying or transposing CWR - rail properly adjusted, anchor pattern standard, ballast not disturbed except cribbed in rail seat area for rail anchor installation.	Refer to chart for track maintenance work when rail temperature is 110 °F or greater										7.8.18
Open-deck bridge tie renewal - Maximum of 25 MPH until all bridge ties are spiked and rail anchors installed, if applicable.	Maximum of 13 consecutive bridge ties unspiked						●				7.8.19
Field welds, pull-a-part repair, replacing defective rails and cutting in epoxy joints in CWR. Rail must be readjusted. Reapply & tighten anchors.											7.10 7.9.1 7.9.2
Integrity of the track structure is disturbed by derailment, track panel installation, turnout or road crossing repairs, or other type work. Additional actions may be required based upon work performed.	●										7.9.3
Track becomes misaligned during work and cannot be restored to proper alignment by lining.	Cut, adjust, and make anchors and ballast section sufficient to maintain track stability. Comply with actions required for the appropriate track maintenance										7.5.1
Rail is added in Turnout Zone [Note 3]	Maximum of 25 MPH until track is adjusted										4.16
Curve worked in cold weather shifts inward more than an average of 1" and temperatures are increasing significantly.	Maximum of 25 MPH until alignment is restored or track is adjusted.										7.5.2 7.9.4

Notes

For ballast compaction, accumulated tonnage may be used if information is available. A Tonnage Train is defined as a train consisting of at least 5,000 gross tons. (Example: 10 Tonnage Trains = 50,000 tons, 2 tonnage trains = 10,000 tons, etc.)

19 passener trains = 1 tonnage train

The track must be inspected before any speed restriction is changed or removed.

Submit Track Disturbance Report for all track work listed.

Note 1: If ties are installed during spot maintenance work when rail temperature is expected to be 110° or greater, a tamper must be used or rail cut and adjusted

Note 2: The track in Turnout Zone must be surfaced with a tamper or rail cut and adjusted on the day of tie installation.

Note 3: If rail is added at any time or temperature within the Turnout Zone, a 25 mph speed restriction must be placed until rail is a

CFRC

REQUIRED ACTIONS FOR PREVENTING TRACK BUCKLING

Track Maintenance Work when Rail Temperature is 110 °F or Greater

	Actions																
	Spot maintenance should not be performed unless necessary for safe passage of trains	10 MPH until ballast is made sufficient to maintain track stability	10 MPH for 10 tonnage trains until 2100 hours the next day	10 MPH for 2 tonnage trains AND rail temperature has dropped below 110°F	10 MPH for 1 tonnage train AND rail temperature has dropped below 110°F	Maximum of 25 MPH for 1 tonnage train	25 MPH for 2 tonnage trains AND rail temperature has dropped below 110°F	25 MPH for 1 day	25 MPH for 10 tonnage trains	25 MPH for 6 tonnage trains	25 MPH for 2 tonnage trains	40 MPH for 1 day	50 MPH for 1 day	50 MPH for 10 tonnage trains	50 MPH for 5 tonnage trains	Field Manual cross-reference
							In effect until 2100 hours on the day tonnage requirement is met.									
Spot ties - Replace up to 4 ties/39' rail length or 3 of 4 consecutive ties - High tonnage tracks [Note 1]	●	●		●					●							7.8.11B
Spot ties - Replace up to 4 ties/39' rail length or 3 of 4 consecutive ties - Other tracks [Note 1]	●	●		●						●						7.8.11B
Spot ties in turnout zone - Replace maximum of 4 ties/40' - All tracks [Note 2]	●	●		●					●							7.8.11D
Tie & Surfacing or replace 5 or more ties/39' rail length or renewing a grade x-ing - High tonnage tracks		●		●					●					●		7.8.12B
Tie & Surfacing or replace 5 or more ties/39' rail length or renewing a grade x-ing - Other Tracks		●		●					●						●	7.8.12B
Tie & Surfacing with use of a dynamic track stabilizer		●					●					●				7.8.22B
Spot Surfacing or Spot Cribbing - an area of 5 ties or less - High Tonnage Tracks	●	●		●					●							7.8.13B
Spot Surfacing or Spot Cribbing - an area of 5 ties or less - Other Tracks	●	●		●						●						7.8.13B
Surfacing out-of-face, smoothing, or surfacing a bridge approach - High Tonnage Tracks		●		●					●					●		7.8.14B
Surfacing out-of-face, smoothing, or surfacing a bridge approach - Other Tracks		●		●						●					●	7.8.14B
Surfacing a sink, slip or roadbed stabilization problem area - High tonnage tracks		●		●					●					●		7.8.15
Surfacing a sink, slip or roadbed stabilization problem area - Other tracks		●		●						●					●	7.8.15
Surfacing with use of a dynamic track stabilizer		●					●									7.8.21B
Shoulder Ballast Cleaning		●									●					7.8.16B
Shoulder Ballast Cleaning (If high side of curves is cleaned, see section 7.8.16 C)		●		●						●						7.8.16C
Track Undercutting Surfaced - High tonnage tracks		●	●						●				●			7.8.17
Track Undercutting Surfaced - Other tracks		●	●							●					●	7.8.17
Track Undercutting Surfaced with use of a dynamic track stabilizer		●			●			●				●				7.8.21B
Laying or transposing CWR - rail properly adjusted, anchor pattern standard, ballast not disturbed except cribbed in rail seat area for rail anchor installation.						●										7.8.18
Open-deck bridge tie renewal - Maximum of 25 MPH until all bridge ties are spiked and rail anchors installed, if applicable.	Maximum of 5 consecutive bridge ties unspiked										●					7.8.19
Field welds, pull-a-part repair, replacing defective rails and cutting in epoxy joints in CWR. Rail must be readjusted. Reapply & tighten anchors.																7.10 7.9.1 7.9.2
Integrity of the track structure is disturbed by derailment, track panel installation, turnout or road crossing repairs, or other type work. Additional actions may be required based upon work performed.		●														7.9.3
Track becomes misaligned during work and cannot be restored to proper alignment by lining.	Cut, adjust, and make anchors and ballast section sufficient to maintain track stability. Comply with actions required for the appropriate track maintenance work.															7.5.1
Rail is added in Turnout Zone [Note 3]	Maximum of 25 MPH until track is adjusted.															4.16
Curve worked in cold weather shifts inward more than an average of 1" and temperatures are increasing significantly.	Maximum of 25 MPH until alignment is restored or track is adjusted.															7.5.2 7.9.4

Notes

For ballast compaction, accumulated tonnage may be used if information is available. A Tonnage Train is defined as a train consisting of at least 5,000 gross tons. (Example: 10 Tonnage Trains = 50,000 tons, 2 tonnage trains = 10,000 tons, etc.)

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Note 1: If ties are installed during spot maintenance work when rail temperature is expected to be 110° or greater, a tamper must be used or rail cut and adjusted

Note 2: The track in Turnout Zone must be surfaced with a tamper or rail cut and adjusted on the day of tie installation.

Note 3: If rail is added at any time or temperature within the Turnout Zone, a 25 mph speed restriction must be placed until rail is adjusted.

PURPOSE:	To set instructions governing the Installation and Thermal Adjustment of Continuously Welded Rail (CWR).
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, Local Environmental Rules and Regulations.
REFERENCES:	MWI 701 Use of Premium Rail Fasteners with CWR MWI 703 Rail Anchoring Policy MWI 901 Road Crossing Installation CFRC 2512, 2513, 2514 Spiking Patterns

I. DISCUSSION

This document concerns the proper procedures for installation and thermally adjusting continuously welded rail installed as part of out of face, curve patch, or new construction projects.

II. PROCEDURE

A. LAYING CONTINUOUS WELDED RAIL

These instructions apply to rail laid out of face, curve patching, repairing of defective rails, or other rail openings in welded rail.

1. For rail replacement projects, ties will be adzed with 0 inch cant (-0” +1/8” to gage) measured at the outside edges of the tie plate during out-of-face and curve patch operations and welded rail laid to 56-1/2 inch gage. Ties on open deck bridges will not be adzed without the approval of the Chief Engineer. For new construction projects, ties will not be adzed.

2. All joints should be welded when the rail is laid. Welding will be done as rail is being laid except when weather conditions prevent adjusting of welded rail for temperature change.

a. If it is not possible to weld a joint, the rail will be drilled with two holes in each rail end to accommodate joint bars with two (2) bolts in the outermost holes. This joint will be welded as soon as practicable but within 60 days one of the following shall occur:
   - Weld joint **or**
   - Install 6 bolts **or**
   - Box anchor joint on every tie for 130 consecutive ties in each direction.

b. For joints being left for later welding, the following information must be marked using permanent paint marker on the web of rail:
   - Date of installation
   - Team Identification
   - Adjusted rail temperature

c. The Roadmaster must be notified of the location of the joint and the information noted in item b above.

3. Transition or compromise rails are used to eliminate the need for bolted or field welded compromise joints at permanent compromise locations. They are designed to be full rail height on the end that matches the new rail specified for the project; and a varying rail height on the end that ties into the existing rail. When using transition rails:

   a. Determine the rail height at the compromise point for the existing rail.
   b. Identify that same rail height on the transition rail.
   c. Mark and cut the transition rail to match the existing rail height.

   See MWI 507 for additional information on transition and compromise rails.

4. Welded rail will be laid and anchored at a minimum adjusted rail temperature in accordance with the following geographical territories:

   a. A minimum adjusted rail temperature of 95° F will be used for territory north of the States of Tennessee and North Carolina except for the State of Virginia.
   b. A minimum adjusted rail temperature of 100° F will be used in the State of Virginia.
   c. A minimum adjusted rail temperature of 105° F will be used for the States of Tennessee and North Carolina and all territory south thereof.

   The minimum adjusted rail temperature listed above in items a, b, and c will be reduced by 20°F when rail is installed within tunnels 500’ and greater in length. Keep the outside neutral temperature for the first 250’ from both ends of the tunnel. Reduce the neutral temperature on the inside of the tunnel beginning 250 from the portal.

The proper minimum adjusted rail temperature will be used to calculate the actual rail expansion needed. See paragraph II.B.7 below for specific details.

5. Welded rail that has not been properly adjusted will be protected by a temporary speed restriction when the ambient temperature is expected to exceed 85° F, rail temperature exceeds 110° F, or when the rail temperature is 40° F greater than the rail laying temperature, whichever occurs first. If rail is laid at a temperature more than 40° F. below the designated rail laying temperature, rail must be adjusted or a speed restriction not exceeding 40 mph must be placed prior to rail temperature above designated rail laying temperature. When tight rail conditions exist, be governed by Engineering Field Manual sections 4.5.1 and 7.5.3.

6. The standard rail anchor patterns are detailed in MWI 703, *Rail Anchoring Policy*. Care must be taken to ensure that all welded rail is anchored to standard. At locations where the standard pattern does not restrain rail movement due to tonnage, grade, curvature, or other local conditions, the Roadmaster will provide justification to the Chief Engineer for the application of additional anchors.

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

   a. Ballast Deck Bridges - CWR will use the standard anchor pattern as described in paragraph MWI 703, *Rail Anchoring Policy*.
   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 Chief Engineer 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

8. The Roadmaster will submit the details of bridges not meeting the

requirements in paragraph 7 above to the Chief Engineer for review. The Chief Engineer will provide the anchorage requirements.

9. The standard track spiking patterns are detailed in CFRC Standard Drawings 2512, 2513, and 2514. Care must be taken to ensure that all welded rail is spiked to standard. If positive restraint fasteners are present, lock spikes will be replaced with screw spikes and proper tie plates.

B. ADJUSTING CONTINUOUS WELDED RAIL to OBTAIN PROPER ADJUSTED RAIL TEMPERATURE

1. Welded rail being laid with a rail temperature less than stated in Paragraph II.A.4. will be adjusted for length by heating the rail or using a rail expander.

2. The Manager in charge of the rail laying operation is responsible to see that rail is properly adjusted for length and anchored as it is laid. The anchoring operations will be no more than 100 feet behind the rail heater when in use and the anchors must be applied only when the rail had achieved the necessary expansion movement and the rail is at or above the desired temperature.

3. The Manager in charge of the rail laying project is responsible for the quality of welding within the rail laying team.

4. When field welds are installed, caution must be exercised to ensure that rail length is not increased in the joint welding process.

5. The Manager in charge of the rail laying project will ensure a fire prevention plan is in place for heating rail on open deck bridges as developed during planning meetings prior to the rail laying project. Pursuant to MWI 1101, coordination with the –Chief Engineer is required prior to arriving at a bridge where rail will be heated.

6. Tracks in new construction, except when using track laying machine, must be tamped and have a standard ballast section prior to rail adjustment.

7. Adjustment Procedure

   a. Complete the form, *Record of Rail Laying Temperature for Continuous Welded Rail*, as the day progresses. Each string of welded rail is numbered at both ends near the initial and final weld by the welding plant. Enter this number in the second column, "String Number", as each string is laid.

   b. Using a rail thermometer, determine the average cold rail temperature of each rail immediately prior to adjustment by taking three measurements along the

string. Measure temperature on the shady side of the web.

1) Production Teams will be equipped with approved digital thermometers. These read instantly and temperature measurements can be made quickly. Ensure that non-contact infrared thermometers are held approximately 18 inches to the rail that is being measured to ensure that only the temperature of the rail is being measured and not the surrounding materials.
2) Teams will normally be equipped with the standard dial rail thermometer. To obtain an accurate reading leave the thermometer in place until temperature reading becomes steady, normally about five minutes.

Read the rail temperature and enter the average of the three readings in Column C, "Cold Rail Temperature", of the form.

c. Leave a gap between the string being adjusted and the next string to provide for expansion. The length of the gap should be sufficient to allow for the expansion. The gap is to be protected from opening or closing by applying rail anchors on the string ahead for 50 feet.

d. If rail is installed in a continuous operation not completely in tie plates to produce a gap at the end, ensure that the required expansion is achieved for each quarter portion calculated for that length of rail.

e. Determine the required rail expansion from the *Change in Rail Length due to Change in Temperature* Chart.

   1) Measure length of the rail and enter in Column A, "Rail Length in Feet".
   2) Select the required adjusted rail temperature from Paragraph II.A.4. and enter in Column B.
   3) The average cold rail temperature is shown in Column C.
   4) Compute the difference in temperature by subtracting Column C from Column B and enter in Column D. If the cold rail temperature is below the required adjusted rail temperature, see next Paragraph to determine the expansion required. If the cold rail temperature is greater than the required adjusted rail temperature, no adjustment needed.
   5) Use chart, *Change in Rail Length due to Change in Temperature*, by locating the row corresponding to rail length and column corresponding to the temperature difference computed in the Paragraph above. Read the expansion length in inches at the intersection of the rail length row and temperature length column. Enter in Column E," Required Expansion".

f. For strings 720’ or longer - reference mark the rail base and the tie plates at the quarter points of the strings. For strings less than 720’ long - reference

mark at the center point of the string. The rail should be measured and reference marked at the same time the cold rail temperature is determined. For example, if you have the following conditions:

1) String length - 1440 feet - Make reference marks on the base of the rail and a secure tie plate at the 360', the 720', and the 1080' quarter points.
2) String length - 500 feet - Make reference marks on the base of the rail and a secure tie plate at the 250' center point.

These reference marks will be used to measure the expansion during adjustment. Adjustment must be as uniform as possible throughout entire string. For example, if you have the following conditions:

1) String length - 1440 ft
2) Cold rail temperature - 75°F^{o}
3) Adjusted rail temperature - 100°F

Using the *Record of Laying Temperature for Continuous Welded Rail* and the *Change in Rail Length due to Change in Temperature* chart, it is determined that the required expansion is 2 3/4". With the rail reference marked at the quarter points, the foreman would look for one -quarter of the expansion at the first reference mark (11/16"), one-half of the expansion at the second reference mark (1 3/8"), three- quarters of the expansion at the third reference mark (2 1/16") and the full expansion of 2 3/4" at the end of the string.

g. Rail heaters or rail expanders will be used to obtain the required expansion.

h. The Manager in charge of the rail laying project will ensure that the rail heater is operated uniformly and continuously. Vibrate the rail to aid in the rail expansion; do not strike the rail with hammers or other devices.

i. If the required expansion cannot be obtained with rail heaters, do not bump therail. Use rail expanders or cut the rail into shorter strings.

j. If the complete expansion as determined in Paragraph II.B.5.e. has not been obtained, place a wooden shim in the joint. The length of the wooden shim will be the amount of required expansion less the measured amount that the rail has expanded since laying.

k. The wooden shim will remain in place until the next rail is laid and anchored for 250 feet. At this time the wooden shim is removed, then the first rail is expanded uniformly to fill the gap and the joint is made.

l. Record the amount of expansion in Column F, "Actual Expansion". Then compute the temperature compensation based on the actual expansion from the chart on page 14, *Change in Rail Length due to Change in Temperature*, and record this temperature in Column G. Add the "Cold Rail" and "Compensated" temperatures, Columns C + G, to determine the adjusted temperature. This must be equal to or greater than the adjusted rail temperature specified in Paragraph II.A.4.

m. The Manager will give the completed *Record of Laying Temperature for Continuous Welded Rail* to the Roadmaster after the rail has been laid. The Roadmaster will forward copies to the Chief Engineer.

6. If rail being installed is at or above desired rail laying temperature prior to being installed, mark each quarter point and note no movement in the *Record of Laying Temperature for Continuous Welded Rail*.

7. The Manager must ensure that rail is properly adjusted and all documentation completed before the team leaves the rail laying area.

C. CURVE PATCH WELDED RAIL

1. A string of welded rail used for curve patch must be adjusted to the adjusted rail temperature specified in Paragraph II.A.4.

2. The length of rail removed will be measured, the cold rail temperature of the replacement rail measured and the amount of expansion determined in the same manner as for laying rail out of face. See Paragraph II B.7.

3. The rail ends will be miss-matched until proper adjustment is obtained. See Paragraph II B.7. for detailed procedures.

4. Resistance to expansion may be experienced on sharp curves. If this occurs, it is permissible to anchor one rail length in the center of the curve, bypass the rail ends at each end of the string and then expand and vibrate the rail from the center to each end.

D. REPAIR of DEFECTS

1. Before cutting the rail, make reference marks on the web of the rail at least two feet outside the affected area (cut points or joint). Measure the distance between the marks and record it on the web of the rail. Use a permanent paint marker to mark the rail; do not use chalk, keel, or temporary marks. The

marks should be made on the side of the rail. See figure 1 for detailed information on making reference marks.

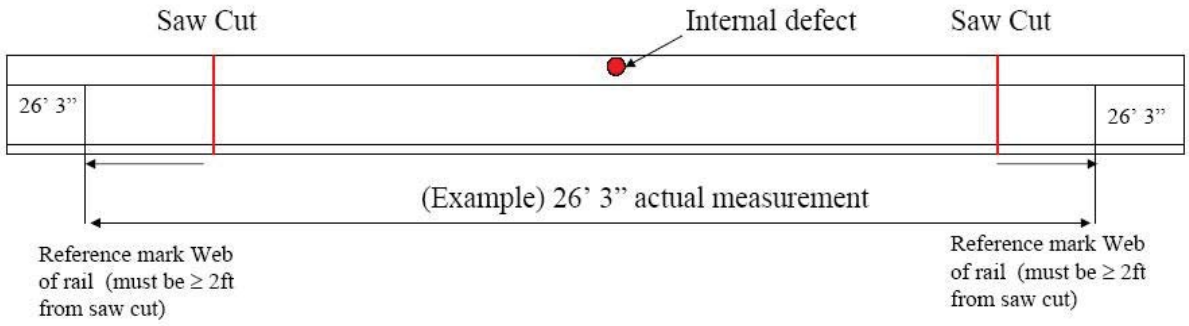

Figure 1. Example of Reference Marks for Rail Plug Change Out

2. Once the rail plug has been replaced, the distance between the reference marks should be the same as the distance recorded on the web of the rail.

3. Record the amount of rail added (if any) on the *Pull Apart and Rail Repair Reporting Form.* A sample of the form is shown in MWI 1109. The *Pull Apart and Rail Repair Reporting Form* shall be completed even if no rail was added. Enter 0 for rail added if the rail was adjusted when installed.

4. This information must be entered Maximo.

5. Rail that has not been properly adjusted will be protected by temporary speed restrictions when the ambient temperature is expected to exceed 85° F, rail temperature exceeds 110° F, or when the rail temperature is 40° F greater than the rail laying temperature. Use the reference marks made in item 1 of this section in determination of whether the track is properly adjusted. Complete a *Track Disturbance Report* once the rail is properly adjusted.

CFRC
Central Florida Rail Corridor

RECORD OF RAIL LAYING TEMPERATURES FOR CONTINUOUS WELDED RAIL

YEAR:_______ DIVISION:__________________ SUBDIVISION:______________________

LAYING DATES:______________________________ NEAREST STATION:__________________

RAIL WEIGHT:_____ TYPE RAIL ANCHORS:________________ TYPE BALLAST:______________

RAIL N S E W	DATE	STRING NUMBER	MILEPOSTS INCLUDING PREFIX		TRACK SC 1 2 YD WYE	RAIL LENGTH IN FEET	RAIL TEMPERATURE			REQUIRED EXPANSION IN INCHES	ACTUAL EXPANSION OBTAINED IN INCHES	LIST CHANGE IN TEMPERATURE FROM CHART IN MWI 1125	ADJUSTED LAYING TEMPERATURE
			FROM	TO		A	DESIGNATED RAIL LAYING TEMPERATURE 95, 100, OR 105 B	COLD RAIL TEMPERATURE C	DIFFERENCE IN TEMPERATURE D	E	F	G	C + G

ADJUSTMENT SUPERVISOR: __________________________ RAIL MANAGER: __________________________

C = 12 X 0.0000065LT

C = CHANGE IN LENGTH IN INCHES

L = LENGTH OF RAIL IN FEET

T = CHANGE IN TEMPERATURE IN DEGREES

CHANGE IN RAIL LENGTH DUE TO CHANGE IN TEMPERATURE

	CHANGE IN TEMPERATURE IN DEGREES FAHRENHEIT															
LENGTH OF RAIL - FEET	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
100	0	0-1/8	0-1/8	0-1/8	0-1/4	0-1/4	0-1/4	0-3/8	0-3/8	0-3/8	0-3/8	0-1/2	0-1/2	0-1/2	0-5/8	0-5/8
200	0-1/8	0-1/8	0-1/4	0-3/8	0-1/2	0-1/2	0-1/2	0-5/8	0-3/4	0-3/4	0-7/8	0-7/8	1	1-1/8	1-1/8	1-1/4
300	0-1/8	0-1/4	0-3/8	0-1/2	0-5/8	0-3/4	0-7/8	1	1	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4	1-7/8
400	0-1/8	0-3/8	0-1/2	0-5/8	0-3/4	1	1-1/8	1-1/4	1-3/8	1-1/2	1-3/4	1-7/8	2	2-1/8	2-3/8	2-1/2
500	0-1/4	0-3/8	0-5/8	0-3/4	1	1-1/8	1-3/8	1-1/2	1-3/4	2	2-1/8	2-3/8	2-1/2	2-3/4	2-7/8	3-1/8
600	0-1/4	0-1/2	0-3/4	0-7/8	1-1/8	1-3/8	1-5/8	1-7/8	2-1/8	2-3/8	2-5/8	2-3/4	3	3-1/4	3-1/2	3-3/4
700	0-1/4	0-1/2	0-7/8	1-1/8	1-3/8	1-5/8	1-7/8	2-1/8	2-1/2	2-3/4	3	3-1/4	3-1/2	3-7/8	4-1/8	4-3/8
800	0-3/8	0-5/8	1	1-1/4	1-1/2	1-7/8	2-1/8	2-1/2	2-3/4	3-1/8	3-3/8	3-3/4	4	4-3/8	4-5/8	5
900	0-3/8	0-3/4	1	1-3/8	1-3/4	2-1/8	2-1/2	2-3/4	3-1/8	3-1/2	3-7/8	4-1/4	4-5/8	4-7/8	5-1/4	5-5/8
1000	0-3/8	0-3/4	1-1/8	1-1/2	2	2-3/8	2-3/4	3-1/8	3-1/2	3-7/8	4-1/4	4-5/8	5-1/8	5-1/2	5-7/8	6-1/4
1100	0-3/8	0-7/8	1-1/4	1-3/4	2-1/8	2-5/8	3	3-3/8	3-7/8	4-1/4	4-3/4	5-1/8	5-5/8	6	6-3/8	6-7/8
1200	0-1/2	0-7/8	1-3/8	1-7/8	2-3/8	2-3/4	3-1/4	3-3/4	4-1/4	4-5/8	5-1/8	5-5/8	6-1/8	6-1/2	7	7-1/2
1300	0-1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-5/8	5-1/8	5-5/8	6-1/8	6-5/8	7-1/8	7-5/8	8-1/8
1400	0-1/2	1-1/8	1-5/8	2-1/8	2-3/4	3-1/4	3-7/8	4-3/8	4-7/8	5-1/2	6	6-1/2	7-1/8	7-5/8	8-1/4	8-3/4
1440	0-1/2	1-1/8	1-5/8	2-1/4	2-3/4	3-3/8	3-7/8	4-1/2	5	5-5/8	6-1/8	6-3/4	7-1/4	7-7/8	8-3/8	9
1500	0-5/8	1-1/8	1-3/4	2-3/8	2-7/8	3-1/2	4-1/8	4-5/8	5-1/4	5-7/8	6-3/8	7	7-5/8	8-1/4	8-3/4	9-3/8
1600	0-5/8	1-1/4	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8	7-1/2	8-1/8	8-3/4	9-3/8	10
1700	0-5/8	1-3/8	2	2-5/8	3-3/8	4	4-5/8	5-3/8	6	6-5/8	7-1/4	8	8-5/8	9-1/4	10	10-5/8
1800	0-3/4	1-3/8	2-1/8	2-3/4	3-1/2	4-1/4	4-7/8	5-5/8	6-3/8	7	7-3/4	8-3/8	9-1/8	9-7/8	10-1/2	11-1/4

MINIMUM ADJUSTED RAIL LAYING TEMPERATURES:
95° FOR THE TERRITORY NORTH OF THE STATES OF TENNESSEE AND NORTH CAROLINA EXCEPT VIRGINIA,
100° IN THE STATE OF VIRGINIA,
105° FOR THE STATES OF TENNESSEE, NORTH CAROLINA AND TERRITORY SOUTH THEREOF.

EXAMPLE 1. HOW MANY INCHES MUST A STRING OF WELDED RAIL 1300 FEET LONG LAID AT A RAIL TEMPERATURE OF 50° EXPAND TO BE ADJUSTED FOR 95°.

95° ADJUSTED TEMPERATURE
LESS 50° LAYING TEMPERATURE
45° CHANGE IN TEMPERATURE

GO TO THE TABLE AND READ THE LENGTH GIVEN IN THE COLUMN HEADED BY THE "45" WHERE IT IS CROSSED BY THE ROW LABELED " 1300" IN THE "LENGTH OF RAIL" COLUMN.
AN EXPANSION OF 4-5/8 INCHES IS REQUIRED

EXAMPLE 2. THE ACTUAL RAIL EXPANSION MEASURED WITH THE STRING OF RAIL GIVEN IN EXAMPLE 1 WAS 4 INCHES. TO WHAT TEMPERATURE IS THE RAIL ADJUSTED AND IS IT ADJUSTED WITHIN THE REQUIRED LIMITS.

GO TO THE TABLE AND FIND 4 INCHES ON THE ROW MARKED "1300". RECORD THE CHANGE IN TEMPERATURE AT THE TOP OF THE COLUMN IN WHICH THE 4 INCHES APPEARS. IN THIS EXAMPLE, 40°.

45° LAYING TEMPERATURE
PLUS 40° FIELD TEMPERATURE
85° ACTUAL ADJUSTED TEMPERATURE

THIS IS LESS THAN THE 95°, 100° OR 105° REQUIRED DEPENDING ON LOCATION); THEREFORE, THE RAIL IS NOT ADJUSTED TO THE REQUIRED LIMIT.

NOTE: AT LOCATIONS, SUCH AS EXPANSION JOINTS, WHERE THERE IS A "FREE END" CONDITION, USE ½ THE AMOUNT SHOWN ABOVE.

III. REPORTS

A. The employee-in-charge of the rail laying will complete the records of rail laying on a continuous basis during rail installation. This information will be loaded into Maximo. The Roadmaster and Chief Engineer can download the information as needed.

B. Tracks not properly adjusted using this method must have a track disturbance report completed and provided to the Roadmaster.

Prepared by: RMW

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

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

Central Florida Rail Corridor

MWI 1404-03

Bridge Approach Ties

Issued: 12/9/13
Revised: 6/12/14

PURPOSE:	To establish a uniform Bridge Approach Tie Policy.
SAFETY:	Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures.
LOCATION:	All CFRC tracks.
ENVIRONMENTAL:	Observe all applicable Federal, State, Local Environmental Rules and Regulations.

I. DISCUSSION

The following instructions supersede all previous instructions concerning bridge approach ties.

II. PROCEDURE

A. Bridge Approach Ties will be used at the following locations:
   1. Both approaches of each track on all open deck main track bridges.
   2. On all other than main track open deck bridges where the maximum authorized speed is greater than 15 miles per hour.

B. The Chief Engineer may request authority from the CFRC Maintenance of Way Manager to install bridge approach ties on specific bridges which are not identified in paragraph II.A. The request must include all the physical and operating characteristics of the specific location.

C. Installation of bridge approach ties required by this policy will be made by the first timbering team performing programmed maintenance through the area.

D. The Chief Engineer, at his discretion, may use other forces to install bridge approach ties prior to the first programmed maintenance activity.

E. Bridge approach ties will tamped in the normal manner on the gage side of the track and for the entire length on the field side of the track.

F. Where installed, bridge approach ties will be in accordance with Standard Drawing Number 2607.

Prepared by: RMW

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Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

MWI 2107-03
Curve Superelevation Markings

Issued: 12/9/13 Revised: 10/9/14

PURPOSE: To provide uniform instructions for *Curve Superelevation Marking.*

SAFETY: Observe all applicable Safety and Operating Rules and Regulations and Safe Job Procedures

LOCATION: All CFRC tracks.

DISCUSSION

A. The curves will be marked to indicate the control points for the curve's superelevation.
   - Tangent to Spiral point (TS),
   - Spiral to Curve point (SC),
   - Curve to Spiral point (CS) and
   - Spiral to Tangent point (ST).

B. The primary and required method will be blue paint on the web of the rail. (see *MWI 1103*)

C. The following supplemental method may be used in addition to the blue paint method shown in paragraph B above at the discretion of the Chief Engineer. One (1) cut spike may be driven into center of the ties closest to the TS point and the ST point. Two (2) cut spikes may be driven into center of the ties closest to the SC point and CS point.

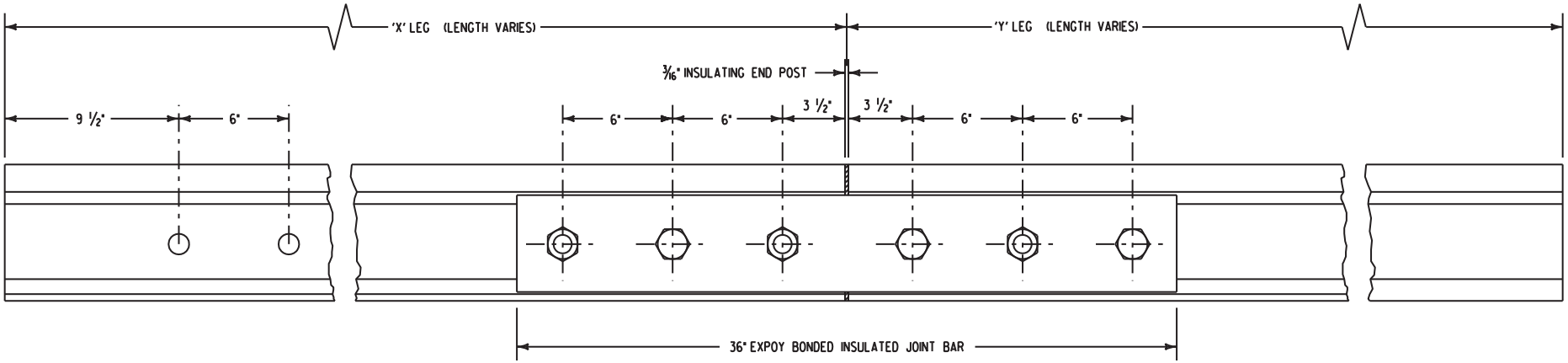
Prepared by: RMW

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

Approved by: _____
Edward Connolly - CFRC Chief Operating Officer

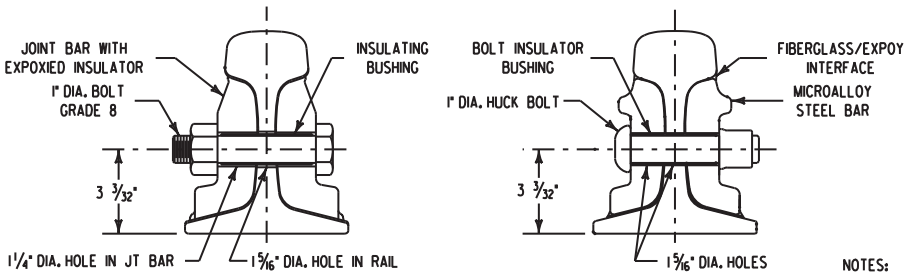
Volume II:

Standard Drawings

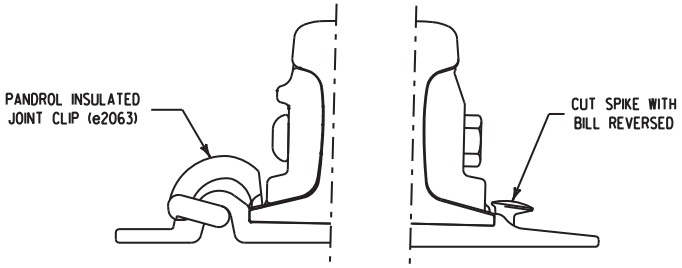


RAIL END DRILLING DETAIL
(IF SPECIFIED IN ORDER)

BLANK END DETAIL



TYPICAL CROSS SECTIONS



TYPICAL FASTENING DETAIL

NOTES:
1. JOINTS TO BE CONSTRUCTED IN ACCORDANCE TO AREMA SPECIFICATIONS PER CHAPTER 4 SECTION 3
2. ALL JOINTS ARE EPOXY BONDED
3. ALL JOINTS USE HEAD HARDENED RAIL PER CFRC SPECIFICATIONS
4. ALL JOINTS HAVE 3/16" INSULATING END POSTS
5. MANUFACTURER IS TO PAINT THE BALANCED LIFTING POINTS OF PLUG
6. TOTAL LENGTHS FOR ALL WEIGHT SECTIONS TO BE 20' AND 40'
7. TOLERANCES FOR LENGTHS:
   A. +/- 4" TOTAL LENGTH
   B. +/- 2" FOR EACH LEG

013.3000300.1	LB FOSTER BONDED INSULATED JOINT BOLT REPLACEMENT KIT
013.3000400.1	PORTEC/KOPPERS BONDED INSULATED JOINT BOLT REPLACEMENT KIT

ORDERING INFORMATION FOR COMMON INSULATED JOINTS			
PREMIUM INSULATED JOINTS			
RAIL WEIGHT	TOTAL LENGTH	LEG LENGTH 'X'	LEG LENGTH 'Y'
115RE	20'	13'-4"	6'-8"
115RE	40'	23'-4"	16'-8"
122CB	20'	13'-4"	6'-8"
122CB	40'	23'-4"	16'-8"
132RE	20'	13'-4"	6'-8"
132RE	40'	23'-4"	16'-8"
136RE	20'	13'-4"	6'-8"
136RE	40'	23'-4"	16'-8"
141RE	20'	13'-4"	6'-8"
141RE	40'	23'-4"	16'-8"

ORDERING INFORMATION FOR COMMON INSULATED JOINTS			
STANDARD INSULATED JOINTS			
RAIL WEIGHT	TOTAL LENGTH	LEG LENGTH 'X'	LEG LENGTH 'Y'
115RE	20'	13'-4"	6'-8"
115RE	40'	23'-4"	16'-8"
122CB	20'	13'-4"	6'-8"
122CB	40'	23'-4"	16'-8"
132RE	20'	13'-4"	6'-8"
132RE	40'	23'-4"	16'-8"
136RE	20'	13'-4"	6'-8"
136RE	40'	23'-4"	16'-8"
141RE	20'	13'-4"	6'-8"
141RE	40'	23'-4"	16'-8"

CFRC
Central Florida Rail Corridor

EPOXY BONDED INSULATED JOINT FOR 115RE, 132RE, 136RE, AND 141RE RAIL

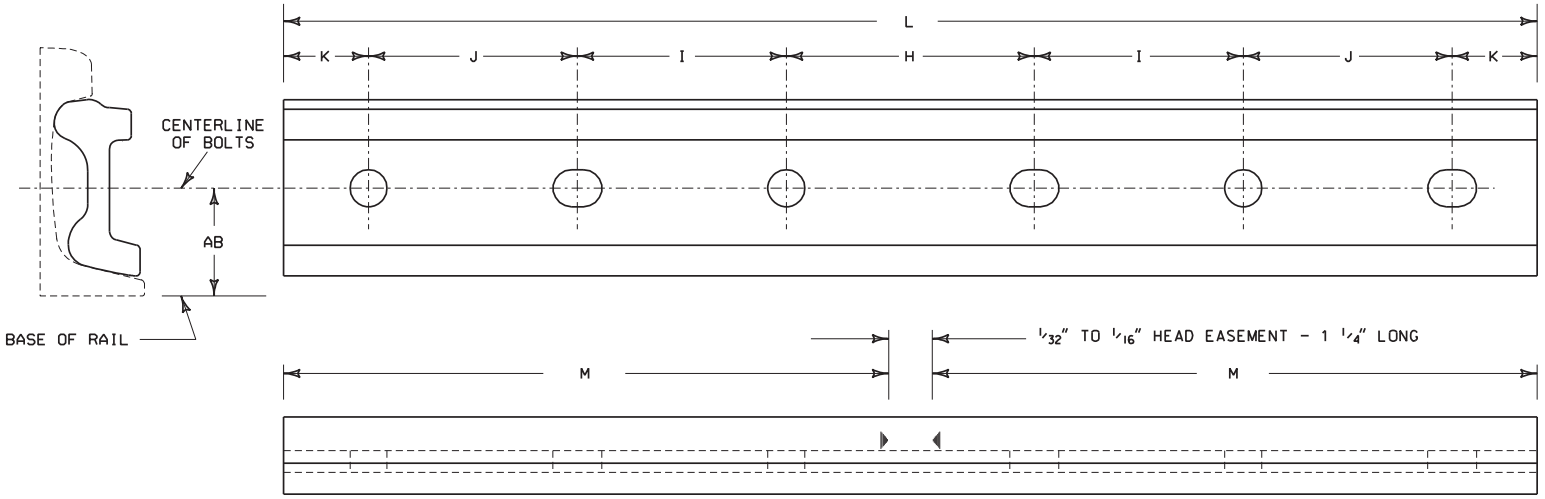
APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

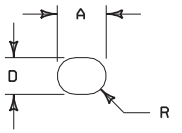
APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
REVISED: SEPTEMBER 26, 2104

2506





OVAL HOLE DETAIL

CIRCULAR HOLE DETAIL

STANDARD JOINT BARS

RAIL SECTION	BOLT SIZE	AB	R	D	A	K	J	I	H	L	M	RAIL DRILLING	SCN
141 RE 136 RE 132 RE	1"	3 3/32"	17/32"	1 1/16"	1 13/32"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/8"	
122 CB	1"	2 7/8"	17/32"	1 1/16"	1 13/32"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/8"	
115 RE	1"	2 7/8"	17/32"	1 1/16"	1 13/32"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/8"	
MAINTENANCE USE JOINT BARS													
140 RE	1 1/8"	3 3/32"	19/32"	1 3/16"	1 9/16"	2 7/16"	6 1/2"	6 1/2"	5 1/8"	36"	17 3/8"	1 1/4"	
	1 1/8"	3 "	19/32"	1 3/16"	1 1/2"	2 1/4"	7"	6"	5 1/2"	36"	17 3/8"	1 1/4"	
	1"	3 "	17/32"	1 1/16"	1 13/32"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/8"	
136 RE 132 RE	1 1/8"	3 3/32"	19/32"	1 3/16"	1 9/16"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/4"	
136 NYC 127 DM	1 1/8"	3 1/8"	19/32"	1 3/16"	1 9/16"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/4"	
133 RE	1"	3"	17/32"	1 1/16"	1 13/32"	2 7/16"	6"	6"	7 1/8"	36"	17 3/8"	1 1/8"	
131 RE	1 1/8"	3 3/32"	19/32"	1 3/16"	1 9/16"	2 7/16"	6 1/2"	6 1/2"	5 1/8"	36"	17 3/8"	1 1/4"	
130 RE	1 1/8"	2 31/32"	19/32"	1 3/16"	1 9/16"	2 7/16"	6 1/2"	6 1/2"	5 1/8"	36"	17 3/8"	1 1/4"	
127 DY	1"	3 1/8"	17/32"	1 1/16"	1 13/32"	3 15/16"	5 5/8"	5 5/8"	5 5/8"	36"	17 3/8"	1 1/8"	
119 RE 115 RE	1"	2 7/8"	17/32"	1 1/16"	1 13/32"	2 7/16"	6 1/2"	6 1/2"	5 1/8"	36"	17 3/8"	1 1/8"	
112 RE	1"	2 7/8"	17/32"	1 1/16"	1 13/32"	2 7/16"	6 1/2"	6 1/2"	5 1/8"	36"	17 3/8"	1 1/8"	
						2 15/16"	–	6 1/2"	5 1/8"	24"	11 3/8"	1 1/8"	
110 RE	1 1/8"	2 53/64"	19/32"	1 3/16"	1 9/16"	3 3/4"	–	5 1/2"	5 1/2"	24"	11 3/8"	1 1/4"	
100 RE	1 1/8"	2 1/2"	19/32"	1 3/16"	1 9/16"	3 3/4"	–	5 1/2"	5 1/2"	24"	11 3/8"	1 1/4"	
100 RB	1"	2 65/128"	17/32"	1 1/8"	1 1/2"	3 "	–	6"	6"	24"	11 3/8"	1 1/8"	
	1"	2 65/128"	17/32"	1 1/8"	1 1/2"	3 3/4"	–	5 1/2"	5 1/2"	24"	11 3/8"	1 1/8"	

STANDARD BOLTS

DIAMETER	LENGTH	DESCRIPTION
1"	5 1/2"	BOLT/NUT
	5 3/4"	BOLT/NUT
	6"	BOLT/NUT
		WASHER
1 1/8"	6"	BOLT/NUT
		WASHER

NOTES

1. NOT ALL RAIL SIZES AND JOINT COMBINATIONS SHOWN FOR SMALLER RAIL SIZES.
2. ALL JOINT BARS TO BE MANUFACTURED IN ACCORDANCE WITH AREMA SPECIFICATIONS
3. ALL JOINT BARS TO HAVE SUPPLIER, MANUFACTURER (IF NOT THE SAME), COMPATIBLE SECTIONS, HEAT NUMBER, AND YEAR OF MANUFACTURE CLEARLY AND PERMANENTLY MARKED ON JOINT BAR WITH RAISED LETTERS OR DEEP STAMPING PURSUANT TO AREMA SPECIFICATIONS.

CFRC
Central Florida Rail Corridor

JOINT BARS FOR STANDARD RAIL SECTIONS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
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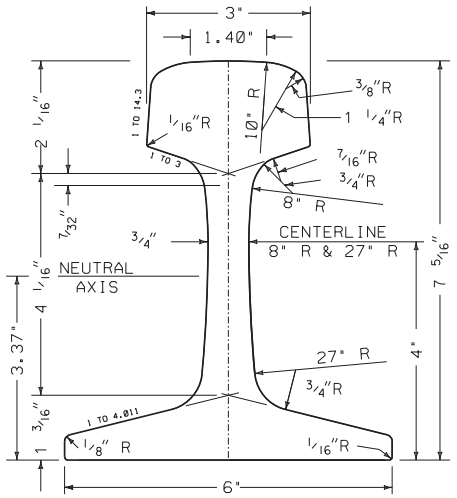
2507



140 RE

AREA :
HEAD - 5.08 IN.^{2} = 37.2 %
WEB - 3.71 IN.^{2} = 27.1 %
BASE - 4.88 IN.^{2} = 35.7 %

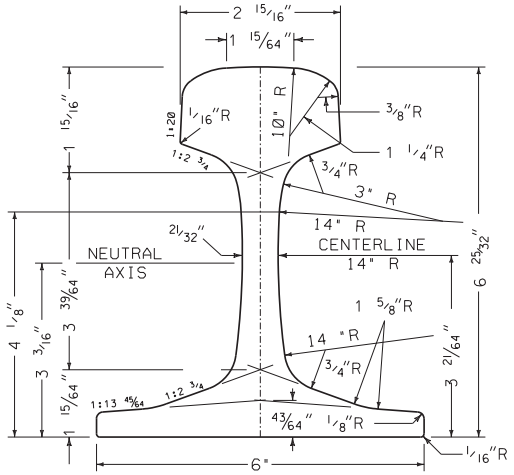
RAIL WEIGHT :
139.36 LBS./YD.

MOMENT OF INERTIA :
95.9 IN.^{4}

SECTION MODULUS :
HEAD = 24.3 IN.^{3}
BASE = 28.6 IN.^{3}

NET TONS PER TRACK MILE :
245.28 TONS

RAIL DRILLING :
3 IN. ABOVE BASE



122 CB

AREA :
12.01 IN.^{2}

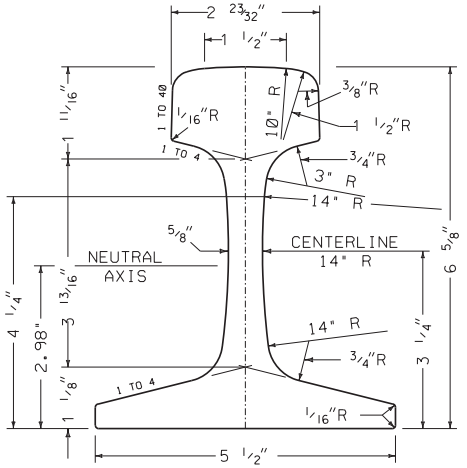
RAIL WEIGHT :
122.5 LBS./YD.

MOMENT OF INERTIA :
74.0 IN.^{4}

SECTION MODULUS :
HEAD = 20.6 IN.^{3}
BASE = 23.3 IN.^{3}

NET TONS PER TRACK MILE :
239.36 TONS

RAIL DRILLING :
2 7/8IN. ABOVE BASE



115 RE

AREA :
HEAD - 3.91 IN.^{2} = 34.8 %
WEB - 3.05 IN.^{2} = 27.1 %
BASE - 4.29 IN.^{2} = 38.1 %

RAIL WEIGHT :
114.7 LBS./YD.

MOMENT OF INERTIA :
65.6 IN.^{4}

SECTION MODULUS :
HEAD = 18.0 IN.^{3}
BASE = 22.0 IN.^{3}

NET TONS PER TRACK MILE :
202.4 TONS

RAIL DRILLING :
2 7/8IN. ABOVE BASE

CFRC
Central Florida Rail Corridor

115 RE, 122 CB AND 140 RE RAIL SECTIONS

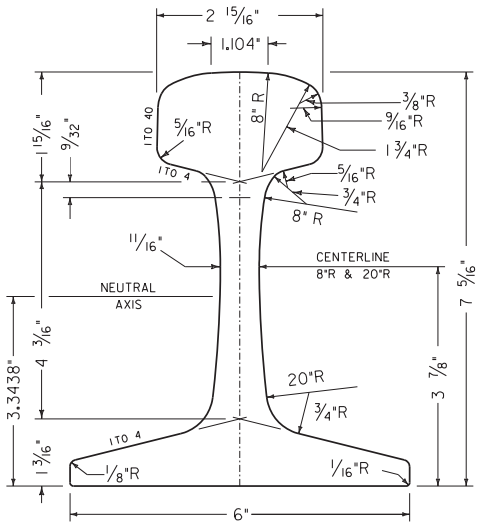
APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
REVISED: SEPTEMBER 26, 2104

EDITORIAL REVISION 8/8/08 - CORRECT MISSING BOTTOM RADIUS DIMENSION 122CB



136 RE

AREA :
HEAD - 4.82 IN.^{2} = 36.3 %
WEB - 3.64 IN.^{2} = 27.1 %
BASE - 4.87 IN.^{2} = 36.6 %

RAIL WEIGHT :
135.9 LBS./YD.

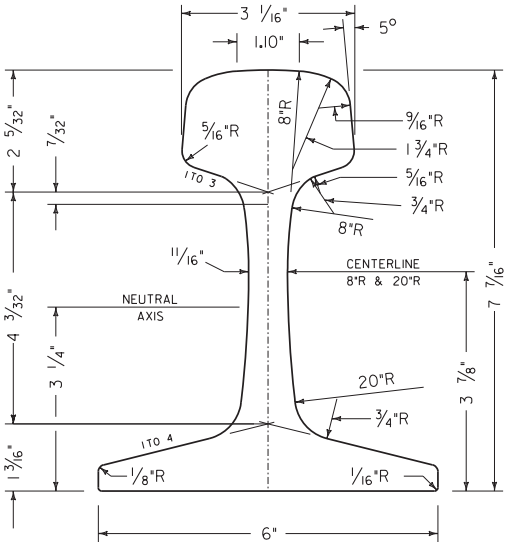
MOMENT OF INERTIA :
94.2 IN.^{4}

SECTION MODULUS :
HEAD = 23.7 IN.^{3}
BASE = 28.2 IN.^{3}

NET TONS PER TRACK MILE :
239.36 TONS

RAIL DRILLING :
3 3/32 IN. ABOVE BASE

HEAD WIDTH :
MAXIMUM = 2.9375 IN.
AT GAGE PT. = 2.8903 IN.



141 RE

AREA :
HEAD - 5.38 IN.^{2} = 38.9 %
WEB - 3.56 IN.^{2} = 25.8 %
BASE - 4.87 IN.^{2} = 35.3 %

RAIL WEIGHT :
140.91 LBS./YD.

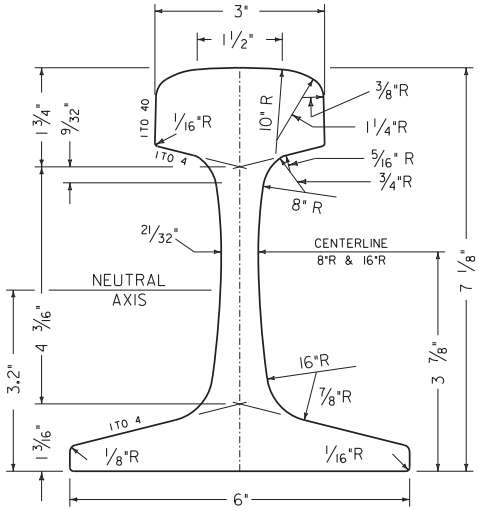
MOMENT OF INERTIA :
100.44 IN.^{4}

SECTION MODULUS :
HEAD = 25.3 IN.^{3}
BASE = 29.0 IN.^{3}

NET TONS PER TRACK MILE :
248.00 TONS

RAIL DRILLING :
3 3/32 IN. ABOVE BASE

HEAD WIDTH :
MAXIMUM = 3.0625 IN.
AT GAGE PT. = 2.9063 IN.



132 RE

AREA :
HEAD - 4.42 IN.^{2} = 34.1 %
WEB - 3.66 IN.^{2} = 28.3 %
BASE - 4.87 IN.^{2} = 36.6 %

RAIL WEIGHT :
132.1 LBS./YD.

MOMENT OF INERTIA :
87.9 IN.^{4}

SECTION MODULUS :
HEAD = 22.4 IN.^{3}
BASE = 27.4 IN.^{3}

NET TONS PER TRACK MILE :
232.32 TONS

RAIL DRILLING :
3 3/32 IN. ABOVE BASE

HEAD WIDTH :
MAXIMUM = 3.0000 IN.
AT GAGE PT. = 2.9650 IN.

CFRC
Central Florida Rail Corridor

132 RE, 136 RE, AND 141 RE RAIL SECTIONS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
REVISED: SEPTEMBER 26, 2104

2512

SPIKING REQUIRMENTS													
TRACK ALIGNMENT		MAIN TRACKS AND SIDINGS								OTHER TRACKS			
		MAXIMUM AUTHORIZED FREIGHT SPEED AND TONNAGE								MAXIMUM SPEED & TONNAGE			
		UP TO 45 MPH		>25 MPH & 10 MGT		46 MPH TO 60 MPH		61 MPH AND HIGHER		UP TO 25 MPH		>25 MPH & 10 MGT	
DEGREE FROM	DEGREE TO	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN	SPIKES PER TIE PLATE	SPIKING PATTERN
TANGENT		2	A	3	B	3	B	4	C	2	A	3	B
0°-01′	1°-59′	3	B	3	B	4	C	4	C	2	A	3	B
2°-00′	3°-59′	4	C	4	C	4	C	4	C	3	B	3	B
4°-00′	5°-59′	4	C	4	C	4	C	4	C	4	C	4	C
6°-00′	11°-59′	5	D	5	D	5	D	5	D	4	C	4	C
12°-00′	12°-59′	5	D	5	D	5	D	5	D	4	C	4	C
13°-00′ AND UP		5	D	5	D	5	D	5	D	5	D	5	D

MAIN TRACK - A TRACK, OTHER THAN AN AUXILIARY TRACK, EXTENDING THROUGH YARDS AND BETWEEN STATIONS, UPON WHICH TRAINS ARE OPERATED IN CONFORMANCE WITH RULES OR SPECIAL INSTRUCTIONS.

SIDING - AN AUXILIARY TRACK DESIGNATED IN SPECIAL INSTRUCTIONS FOR THE MEETING OR PASSING OF TRAINS.

SIDE TRACK - AN AUXILIARY TRACK FOR PURPOSES OTHER THAN MEETING OR PASSING TRAINS.

THE SPIKING PATTERN ON CURVES WILL BEGIN AT THE TANGENT TO SPIRAL MARKER PLATE AND END AT SPIRAL TO TANGENT MARKER PLATE.

THE SPIKING PATTERN ON COMPOUND CURVES WILL BE BASED ON THE HIGHEST DEGREE OF CURVATURE IN THE CURVE AND WILL BE USED FOR THE ENTIRE CURVE.

SIX AXLE LOCOMOTIVES WITH CONVENTIONAL TRUCKS ARE RESTRICTED FROM OPERATING ON CURVES OVER 17°-00′.

SIX AXLE LOCOMOTIVES WITH RADIAL STEERING TRUCKS ARE RESTRICTED FROM OPERATING ON CURVES OVER 23°-00′.

THREE SPIKES PATTERN B AS MINIMUM WILL BE USED ON ALL TRACKS USING DISTRIBUTED OR PUSHER LOCOMOTIVES

IF A TIE PLATE DOES NOT HAVE TWO GAGE SIDE RAIL SPIKES, USE ADDITIONAL SPIKES AS SHOWN IN PATTERN C & D

SPIKING PATTERN "A"

SPIKING PATTERN "C"

SPIKING PATTERN "B"

SPIKING PATTERN "D"

■ - TRACK SPIKE

⊚ - TIE PLATE SCREW

POSITIVE RESTRAINT RAIL FASTENERS
ALL TRACK ALIGNMENTS

PANDROL ROLLED PLATE

PANDROL VICTOR PLATE

CFRC
Central Florida Rail Corridor

MAIN TRACK SPIKING PATTERNS
SIDE TRACK SPIKING PATTERNS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

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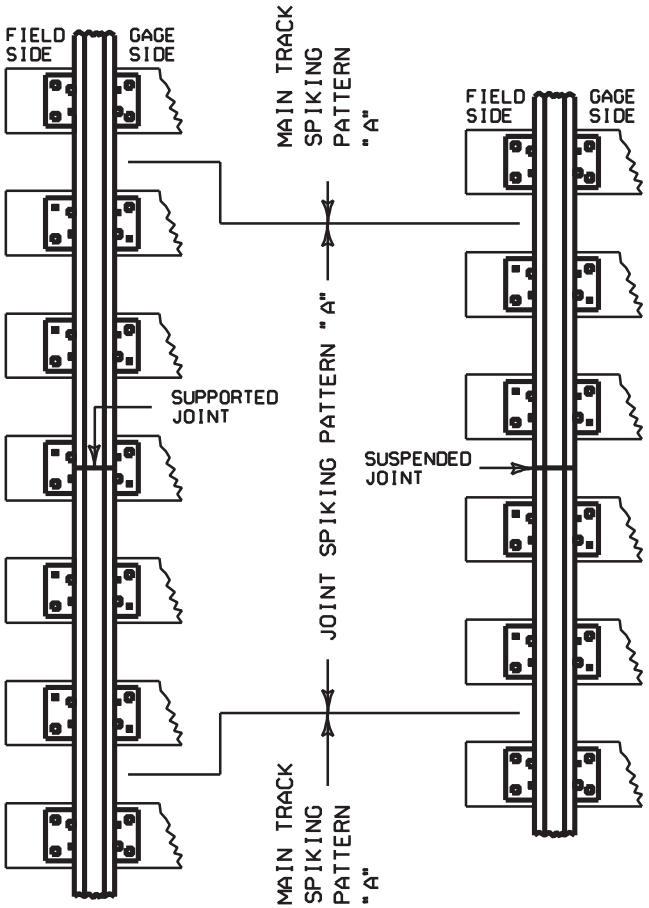
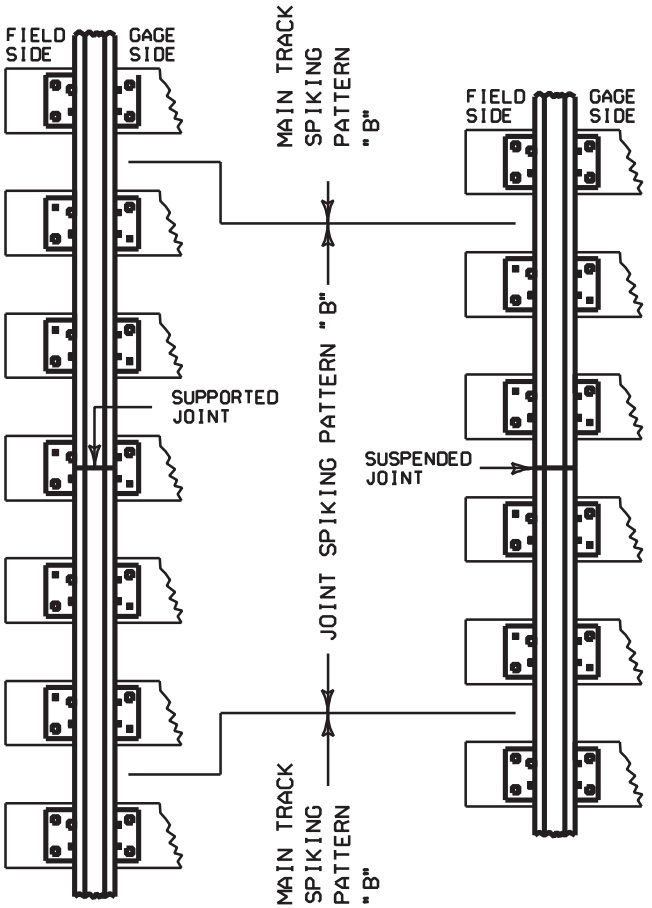
2514



JOINT SPIKING PATTERN "A"



JOINT SPIKING PATTERN "B"

■ = TRACK SPIKE

JOINT SPIKING PATTERN "A" USED WITH MAIN TRACK SPIKING PATTERN "A".

JOINT SPIKING PATTERN "B" USED WITH MAIN TRACK SPIKING PATTERNS "B", "C" AND "D".

SEE DRAWING 2512 FOR SPIKING PATTERNS WHEN POSITIVE RESTRAINT RAIL FASTENERS ARE USED.

CFRC
Central Florida Rail Corridor

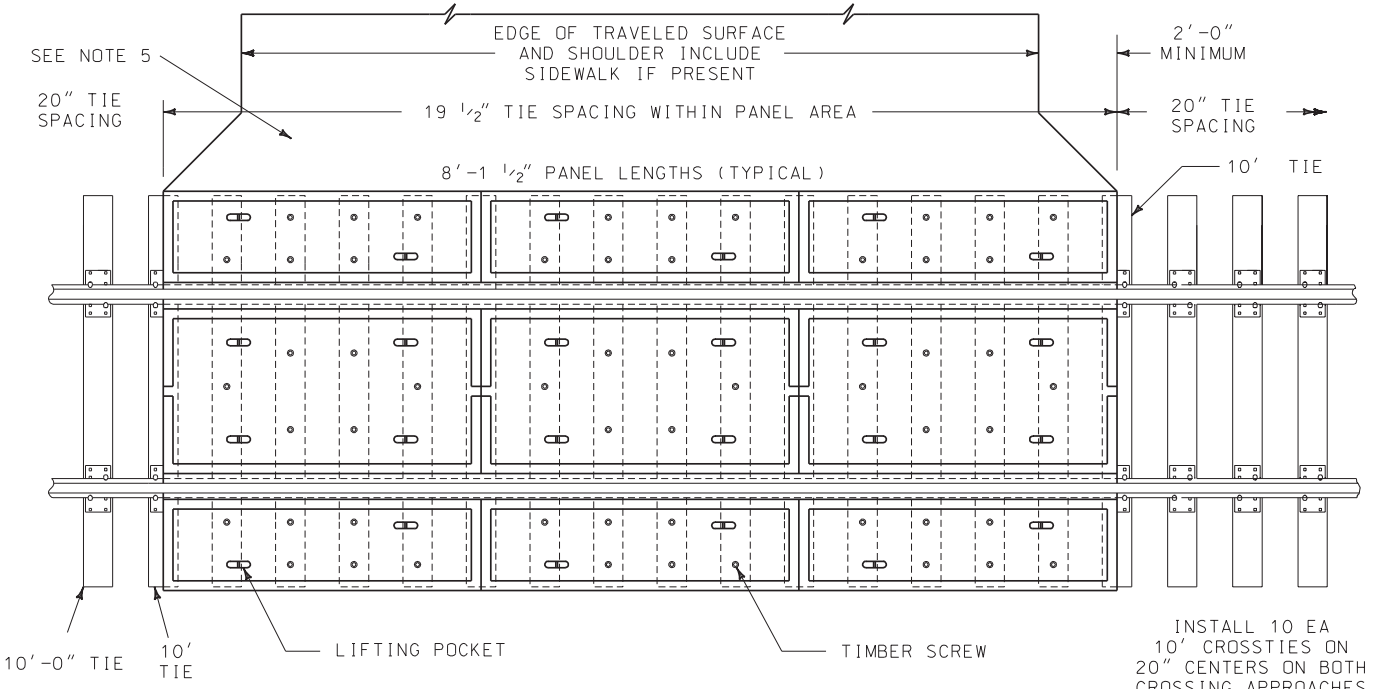
JOINT AREA SPIKING PATTERNS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

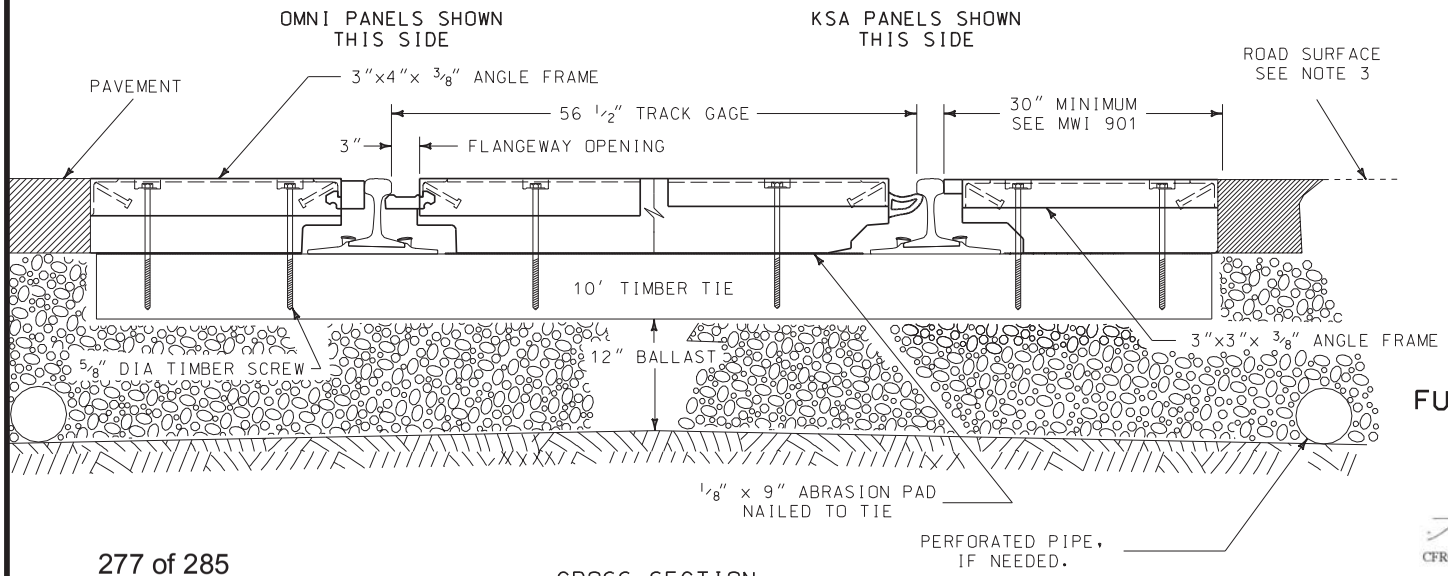
APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
REVISED: SEPTEMBER 26, 2104



CROSSING PLAN VIEW



CROSS SECTION

NOTES

1. MWI 901 (LASTEST REVISION) IS TO BE USED IN CONJUNCTION WITH THIS DRAWING.
2. FOR NEW CONSTRUCTION, HIGHWAY SHOULD INTERSECT RAILROAD AT OR NEARLY RIGHT ANGLES.
3. FOR NEW CONSTRUCTION, HIGHWAY SURFACE SHOULD NO BE MORE THAN 3 IN. HIGHER OR LOWER THAN TOP OF NEAR RAIL 30 FT. FROM THE RAIL ALONG THE ROAD CENTERLINE, UNLESS TRACK SUPERELEVATION DICTATES OTHERWISE.
4. USE STATE DOT SPECIFICATIONS FOR BITUMINOUS CONCRETE AND SPRAY TACK COAT FOR THE STATE IN WHICH THE CROSSING IS LOCATED.
5. CROSSING SHOULD BE CONTINUOUS BETWEEN ROADWAY OR SIDEWALK EDGES. IF NOT PRACTICABLE, DRAINAGE MUST BE PROVIDED BETWEEN PAVED AREAS TO ELIMINATE WATER POCKETS.
6. SLOPE PAVING TO RETURN TO ORIGINAL PAVEMENT SURFACE. LENGTH OF TRANSITION WILL DEPEND ON LOCAL CONDITIONS. USE A RUNOFF OF 1 IN. PER 10 FT. WHERE PRACTICABLE.
7. IF ROADBED STABLIZATION IS REQUIRED, EXTEND IT 10 FT. BEYOND EDGE OF CROSSING UNDER TRACK.
8. APPROXIMATE WEIGHT FOR 136RE MATERIALS:
   3,200 LBS. - CONCRETE CENTER PANEL
   1,700 LBS. - CONCRETE FIELD PANEL
9. PERFORATED PIPE TO BE SIZED AND LOCATED FOR SITE CONDITIONS. USE 6" MIN. DIA. PIPE AND LOCATE AT LEAST 12" BEYOND END OF TIE.
10. INSTALL 10 EA 10 FT. CROSSTIES EITHER SIDE OF CROSSING. INSTALL 10 FT. CROSSTIES 20" CENTER-TO-CENTER.

ORDERING INFORMATION		
	RAIL WGT.	DESCRIPTION
	115 - 122	CROSSING, CONCRETE PANELS, HEAVY DUTY, FOR 10 FT. WOOD TIES. ORDER BY "TRACK FEET" IN APPROX. 8 FT. INCREMENTS. EACH 8'-1 1/2" SECTION INCLUDES 1 CONCRETE CENTER AND 2 CONCRETE FIELD PANELS WITH RUBBER FILLERS.
	132 - 136	
	141	

CFRC
Central Florida Rail Corridor

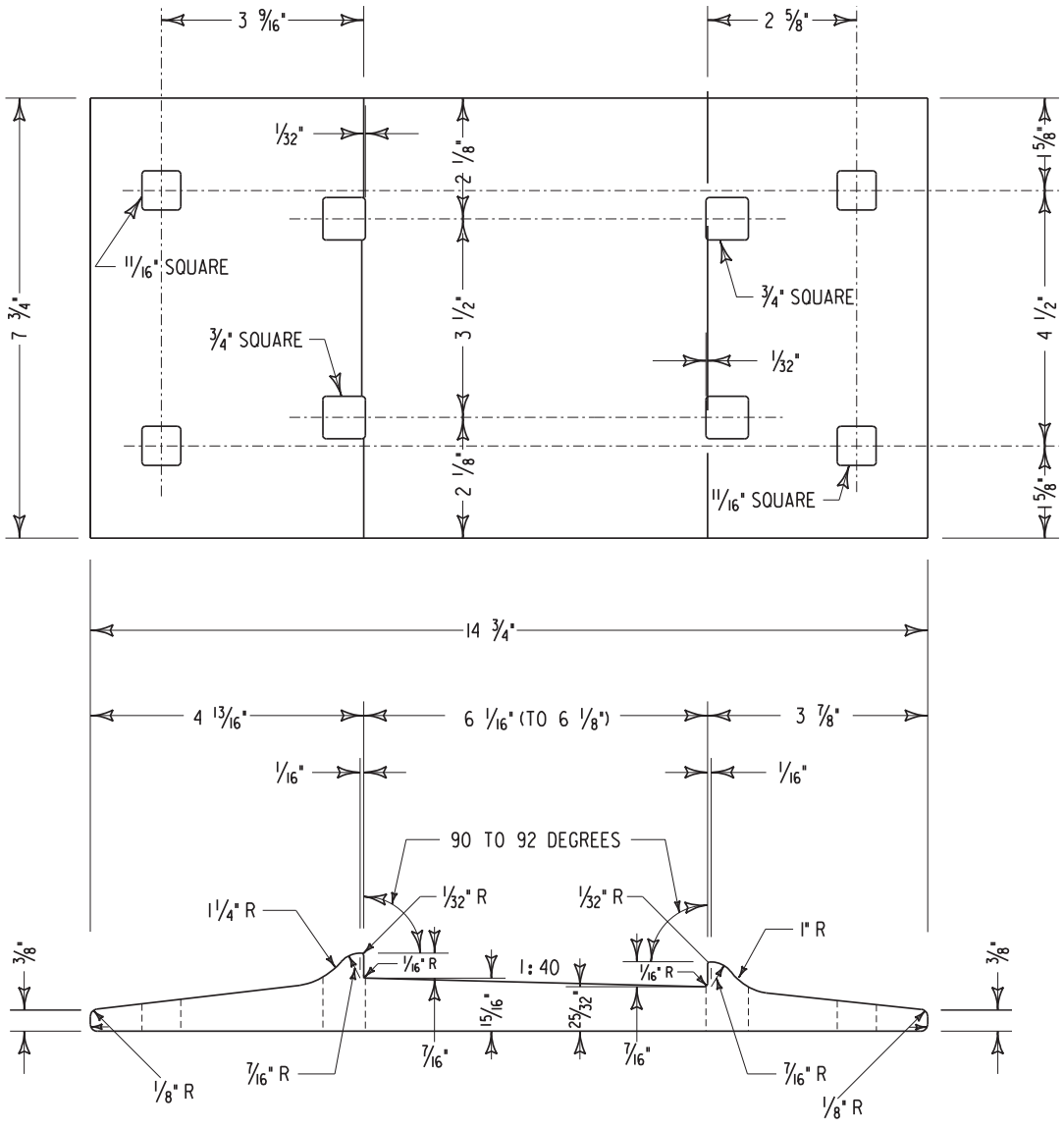
HEAVY DUTY ROAD CROSSING
FULL WIDTH CONCRETE ON WOOD TIES

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
REVISED: SEPTEMBER 26, 2104



NOTES

1. PLATES ARE TO BE FURNISHED WITHOUT RIBS.
2. RAIL SEAT IS TO BE FLAT, WITHOUT CAMBER.
3. ALL SPIKE HOLES USE 1/16" FILLETS IN THE CORNERS.
4. PLATES TO BE BRANDED IN ACCORDANCE WITH SECTION 5 OF THE AREMA MANUAL.
5. MATERIAL AND PROCESS ARE TO CONFORM TO AREMA STANDARDS.
   CARBON - 0.15 % MIN.
   COPPER - 0.20 % MIN.
6. ESTIMATED WEIGHT - 23.32 LBS.

ORDERING INFORMATION		
DESCRIPTION	UNITS	
PLATE, TIE, 7 3/4" X 14 3/4" FOR 6" BASE RAILS	EACH	

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7 3/4" X 14 3/4" TIE PLATE
FOR 6" BASE RAIL SECTIONS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
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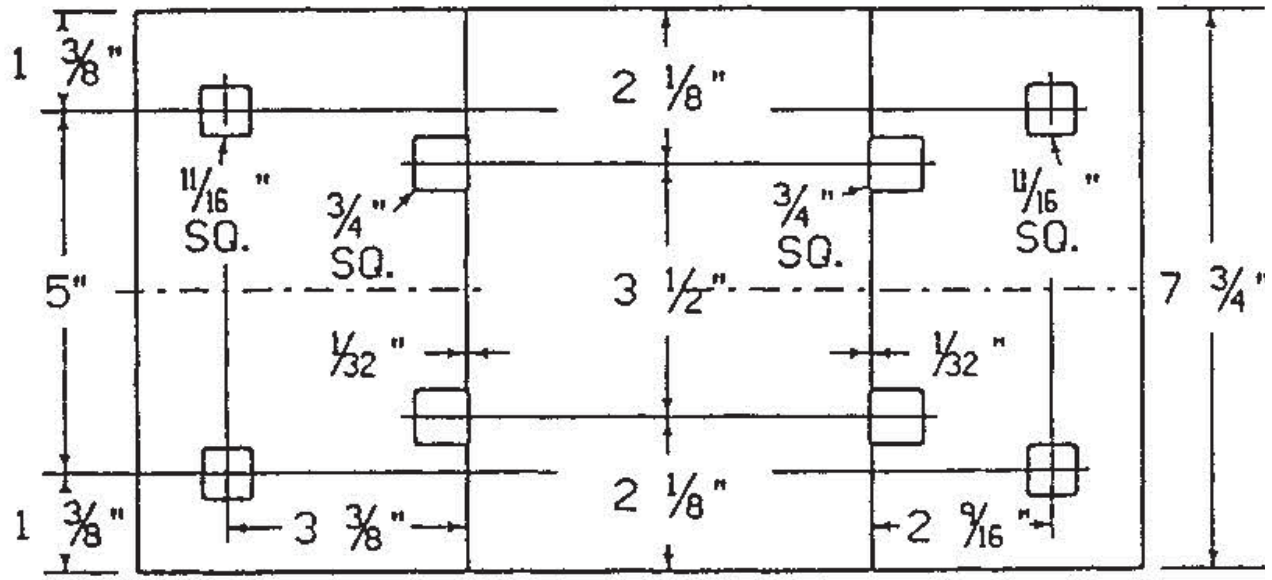
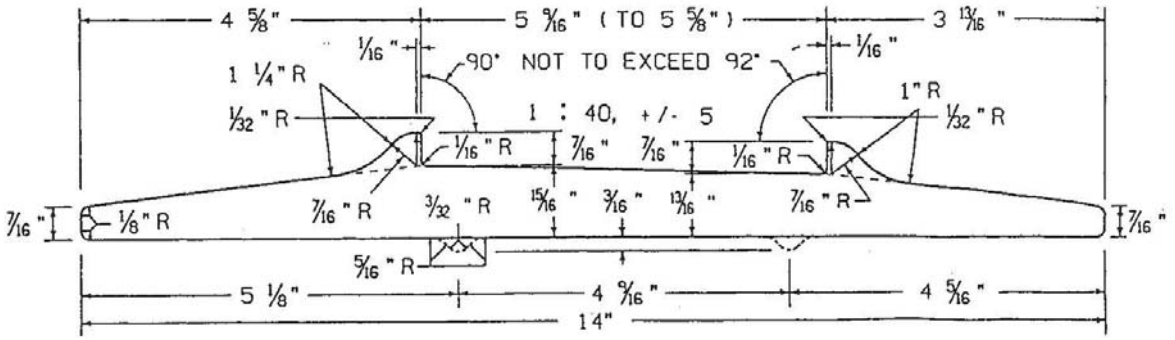
2539



NOTES

1. PLATES ARE TO BE FURNISHED WITHOUT RIBS.
2. RAIL SEAT IS TO BE FLAT, WITHOUT CAMBER.
3. ALL SPIKE HOLES USE 1/16" FILLETS IN THE CORNERS.
4. PLATES TO BE BRANDED IN ACCORDANCE WITH SECTION 5 OF THE AREMA MANUAL.
5. MATERIAL AND PROCESS ARE TO CONFORM TO AREMA STANDARDS.
   CARBON - 0.15 % MIN.
   COPPER - 0.20 % MIN.
6. ESTIMATED WEIGHT – 22.90 LBS.



ORDERING INFORMATION		
DESCRIPTION	UNITS	
PLATE, TIE, 7–3/4" X 14" FOR 5.5" BASE RAILS	EACH	

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Central Florida Rail Corridor

7-3/4" x 14" TIE PLATE FOR 5.5" BASE RAIL SECTIONS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
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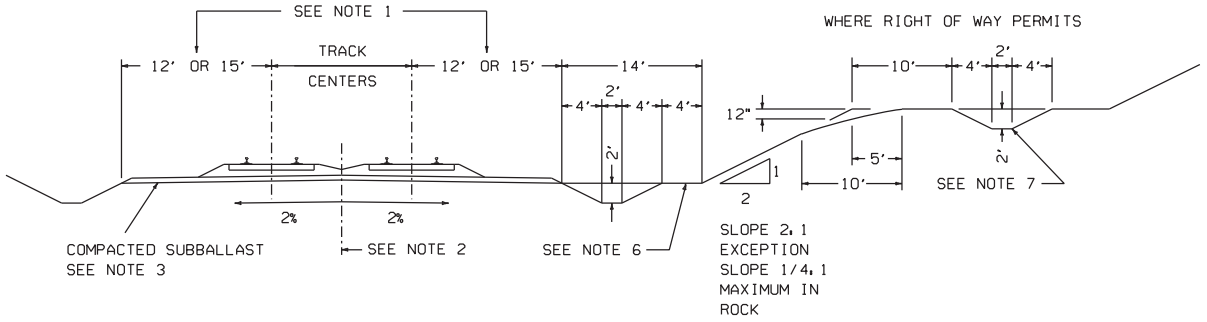
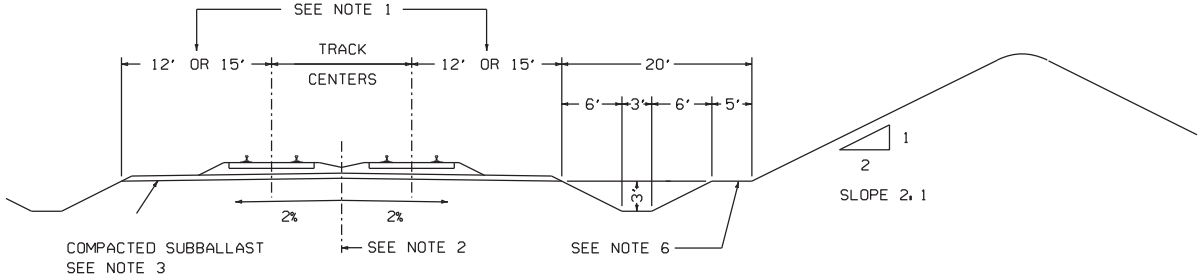
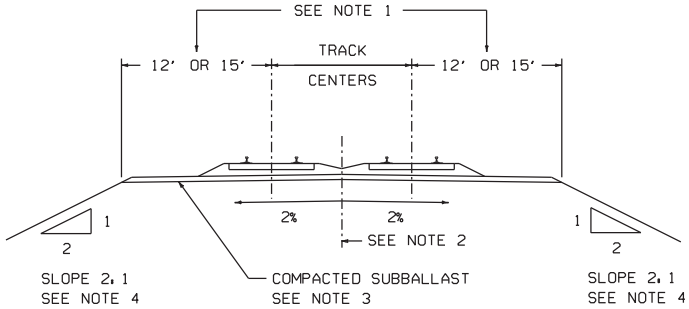
2601



TYPICAL CUT SECTION



TYPICAL WET CUT SECTION



TYPICAL FILL SECTION

NOTES.

1. ROADBED WIDTHS AT TOP OF SUBGRADE.

   A. SINGLE MAIN TRACKS, SIDINGS, AND HEAVY TONNAGE TRACKS. 15'-0" FROM CENTERLINE OF TRACK, 30'-0" TOTAL
   B. SINGLE YARD, INDUSTRY, AND OTHER TRACK, 12'-0" FROM CENTERLINE OF TRACK, 24'-0" TOTAL
   C. MULTIPLE PARALLEL TRACKS. 12'-0" OR 15'-0" FROM CENTERLINE OF TRACK DEPENDING ON THE TYPE OF TRACKS PLUS DISTANCE BETWEEN TRACK CENTERLINES.

2. LOCATION OF GRADE POINT.

   A. SINGLE MAIN OR OTHER TRACK IS THE CENTERLINE OF TRACK.
   B. DOUBLE MAIN TRACKS IS THE CENTERLINE BETWEEN TRACKS.
   C. GRADE POINT FOR MAIN TRACK AND SIDING IS CENTERLINE OF MAIN TRACK.

3. DEPTH OF SUBBALLAST.

   A. SUBBALLAST ON MAIN TRACKS, SIDINGS AND HEAVY TONNAGE TRACKS IS 6" OVER THE 30' ROADBED WIDTH.
   B. SUBBALLAST ON YARD, INDUSTRIAL AND OTHER TRACKS IS 4" OVER THE 24' ROADBED WIDTH.

4. THE STANDARD SLOPE ON FILL SECTIONS MAY BE INCREASED TO A MAXIXMUM OF 1 ½TO 1 AT LOCATIONS WHERE THE BEARING CAPACITY OF THE NATURAL BED HAS BEEN VERIFIED BY FIELD TESTS AND THE STABILITY OF THE FILL MATERIAL VERIFIED BY LABORATORY TESTS.

5. INSTRUCTIONS FOR THE USE AND INSTALLATION OF GEOTEXTILES AND GEOGRIDS ARE INCLUDED IN MWI-1003.

6. OMIT BENCH WHERE EXCAVATION IS 5 FEET OR LESS.

7. OMIT BERM DITCH WHEN NATURAL GROUND SLOPES AWAY FROM THE EXCAVATION.

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ROADBED SECTIONS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
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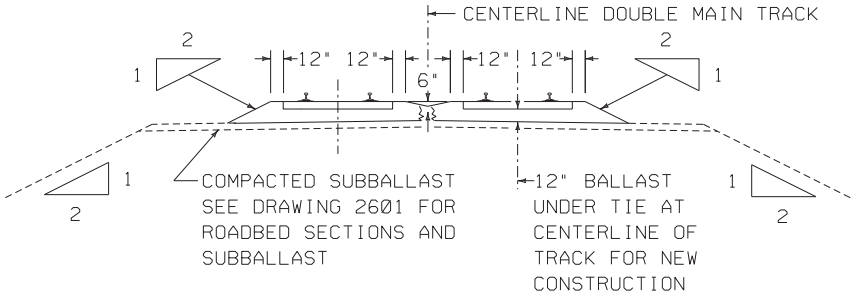
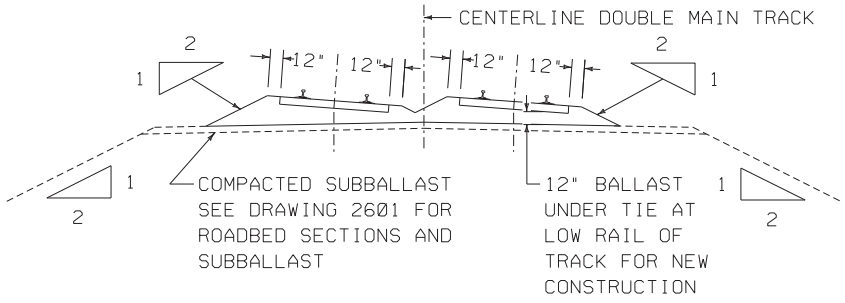
2602



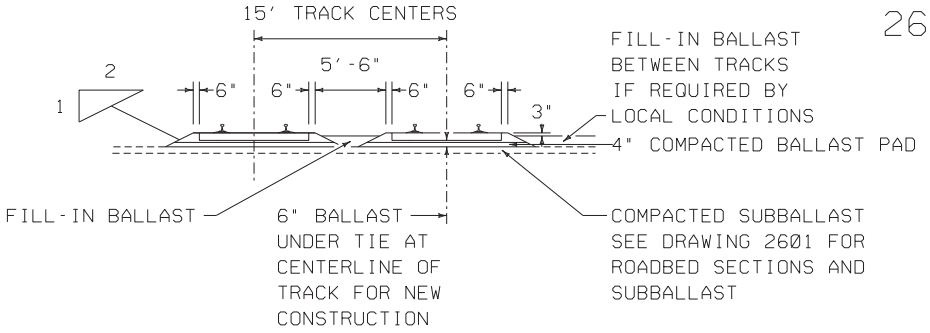
MAIN TRACK, SIDINGS AND HEAVY TONNAGE TRACKS

TANGENT TRACKS

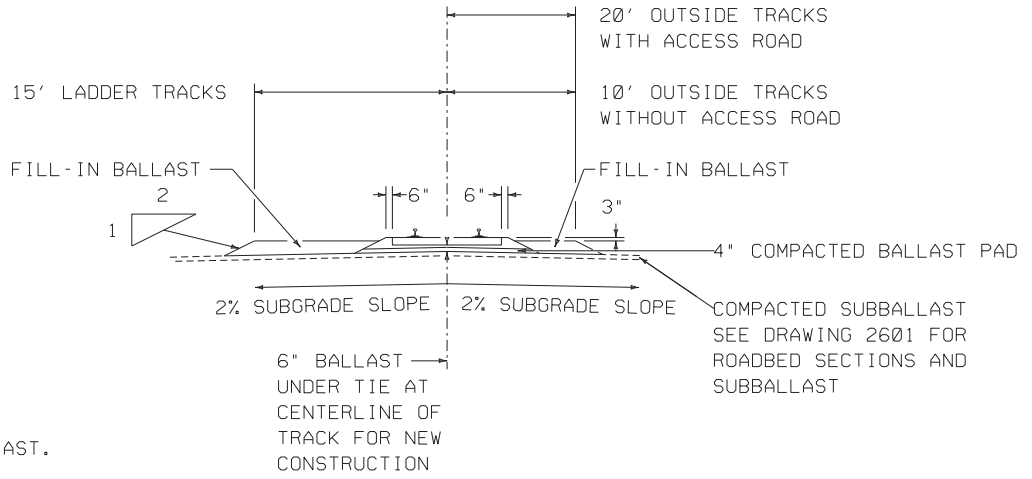


MAIN TRACK, SIDINGS AND HEAVY TONNAGE TRACKS

SUPERELEVATED TRACKS



INTERIOR YARD TRACKS



LADDER AND OUTSIDE TRACKS

NOTES.

1. BALLAST TO CONFORM TO THE CURRENT CFRC SPECIFICATION FOR BALLAST.
2. AREMA GRADATION 4A BALLAST IS TO BE USED ON ALL TRACK EXCEPT YARD TRACKS WHERE AREMA GRADATION 5 IS TO BE USED.
3. BALLAST PAD 4" THICK OF AREMA GRADATION 4A WILL BE USED UNDER TRACK FOR NEW CONSTRUCTION OF YARD TRACKS.
4. FILL-IN BALLAST WILL BE AREMA GRADATION 5.
5. BALLAST TO BE EVEN WITH TOP OF TIE.
6. BALLAST SHOULDER WILL EXTEND 12" FROM END OF TIE TO EDGE OF SLOPE ON ALL MAIN TRACKS, SIDING, AND HEAVY TONNAGE TRACKS.
7. BALLAST SHOULDER WILL EXTEND 6" FROM END OF TIE TO EDGE OF SLOPE ON ALL YARD TRACKS AND INDUSTRIAL SIDING TRACKS.

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Central Florida Rail Corridor

BALLAST SECTIONS

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

ISSUED: DECEMBER 9, 2013
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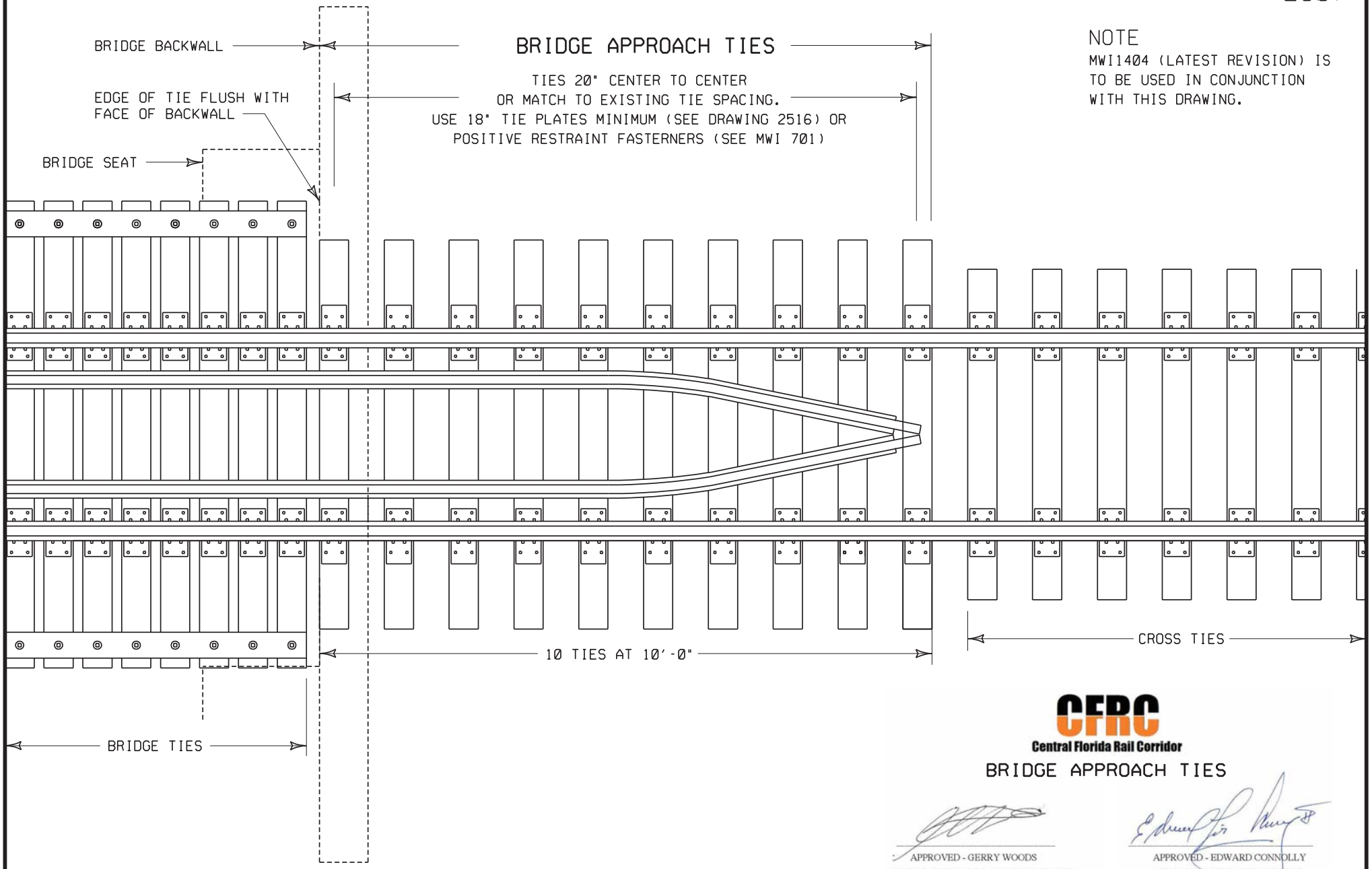
2607



NOTE

MWI1404 (LATEST REVISION) IS TO BE USED IN CONJUNCTION WITH THIS DRAWING.

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Central Florida Rail Corridor

BRIDGE APPROACH TIES

APPROVED - GERRY WOODS
CFRC MAINTENANCE OF WAY MANAGER

APPROVED - EDWARD CONNOLLY
CFRC CHIEF OPERATING OFFICER

PREPARED BY:
R.M. WHITE

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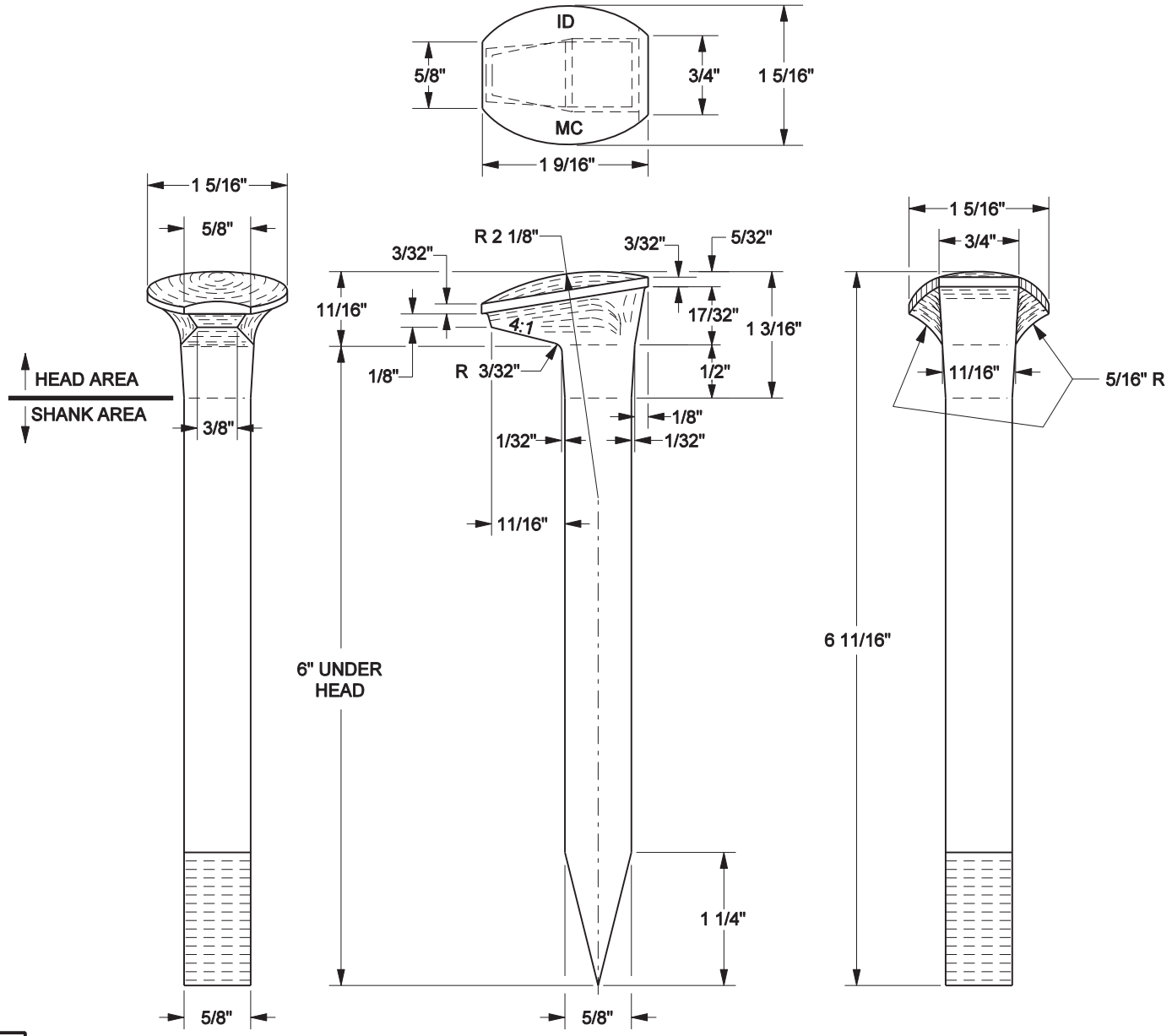
Volume III:

Common Standards



6" CUT TRACK SPIKE

NOTES:
1. MATERIAL AND WORKMANSHIP TO BE IN ACCORDANCE WITH CURRENT AREMA MANUAL REQUIREMENTS FOR MEDIUM CARBON SPIKES.
2. PERMISSIBLE SHANK STRAIGHTNESS VARIATION, MEASURED IN EITHER PLANE, SHALL NOT EXCEED 0.0313".
3. MANUFACTURER'S I.D. AND THE LETTERS "MC" SHALL BE PRESSED ON THE HEAD OF EACH SPIKE WHILE BEING FORMED.
4. WEIGHT = APPROXIMATELY 0.83 LBS. EACH.

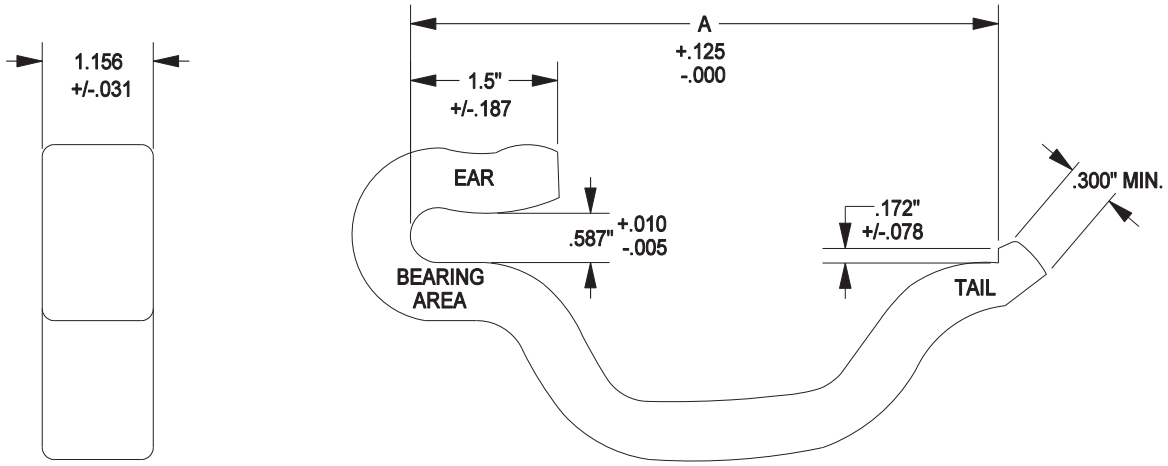
CFRC
Central Florida Rail Corridor

COMMON STANDARDS

6" TRACK SPIKE

FILE OWNER: CFRC	DATE: 9/26/2014
REV. NO.: 2	DWG NO: 130005

130005



RAIL BASE SIZE	A	WEIGHTS
5 1/2"	5.625"	1.96 LBS.
6"	6.125"	2.094 LBS.

NOTES:
1. MATERIAL: HIGH CARBON STEEL

2. HEAT TREAT TO Rc 34-47
   TARGET RANGE Rc 39-44

3. ALL DIMENSIONS ARE MINIMUM UNLESS OTHERWISE SPECIFIED.

4. TYPICAL CHEMISTRY: CARBON .58-.90, MANGANESE .7-1.1, SILICON .5 MAX

CFRC
Central Florida Rail Corridor

BAR STOCK ANCHOR FOR 5 1/2" AND 6" BASE RAIL

FILE OWNER: CFRC	DATE: SEPT 25, 2014
REV. NO.: 1	DWG NO: 135010

135010