



**Procedures for the Installation, Adjustment, Maintenance,
and Inspection of CWR as Required by CFR 213.118
Effective Date March 4, 2021**

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Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR as Required by 49 CFR 213.118

This document details the BNSF Railway's policy on installing, adjusting, maintaining, and inspecting Continuous Welded Rail (CWR) track. Each chapter details how the Railroad applies its standards and procedures to comply with FRA standards. The procedures listed in this document apply to CWR on all main tracks, sidings, and other tracks over which trains operate.

Chapter 1 CWR Installation Procedures

Rail length that exceeds 400 feet is considered CWR. Rail installed as CWR remains CWR, regardless of whether a joint or plug is installed into the rail at a later time. Temperature variations affect rail length. Rail expands (lengthens) when heated and contracts (shortens) when cooled.

1.1 Neutral Temperature

The neutral temperature is the temperature at which a rail is neither in tension nor compression. Target Neutral Temperatures (TNTs) have been established to provide a specific desired neutral temperature to prevent track buckling. When laying or adjusting CWR, use Figure 1.1 *Target Rail Laying Temperatures*. Within tunnels greater than 800 feet in length rail shall be installed and maintained at tunnel ambient temperature instead.

1.2 Temperature Differential

The difference between the Target Neutral Temperature and the actual rail temperature taken at the time of installation is called the temperature differential. CWR laying and adjusting procedures have been established to compensate for this temperature difference.

1.3 Installing CWR

Follow these general requirements when laying CWR:

- Install rail with a neutral temperature within the safe zone defined as Target Neutral Temperature (TNT) $\pm 20^{\circ}\text{F}$ for that location. Refer to Target Rail Laying Temperatures (Chapter 1.1) for the target rail laying temperature for your location.
- Establish one or more measurement stations no greater than 400 feet apart. Take the initial rail temperature and calculate the expansion required at each station before making adjustment.
- Use rail heaters or rail expanders to adjust the rail to the correct length when the actual rail temperature is less than the Target Neutral Temperature. Heat the rail evenly and uniformly so that the rail expansion occurs evenly and uniformly throughout its length.

- For each measurement station record the initial rail temperature, the final adjusted rail neutral temperature, location, and date.
- If rail is not installed within the safe zone, be guided by section 3.1 of these CWR procedures for protection and future adjustment.

Exception: if actual rail temperature results in rail being installed at a neutral temperature above the safe zone, the rail does not need to be subsequently adjusted unless evaluation of location identifies conditions significantly reducing lateral strength or longitudinal restraint – record a work order for subsequent readjustment if such conditions are identified.

- When tight rail conditions exist, be governed by Chapter 7.1 of these procedures.

Chapter 2 Rail Anchoring Requirements

Where the anchoring function is otherwise provided by elastic fasteners, rail anchors may be omitted. Anchors should not be applied where they will interfere with signal or other track appliances, where they are inaccessible for adjustment or inspection, or on rail opposite a joint. Anchor pattern may be varied as reasonable to avoid placing anchors against deteriorated ties.

Installation

The following anchoring requirements apply to CWR installations on all main tracks, sidings, and other tracks over which trains operate.

2.1 Standard Box Pattern

When installing CWR, box anchor every other tie except as outlined in Chapter 2.2 of these CWR procedures.

2.2 Solid Box Pattern

When installing CWR, box anchor every sound (effective) tie at specific locations listed in the table below to provide additional restraint against rail movement.

Condition	Action
Turnouts*, Crossing Frogs, Open-Deck Bridges, and where CWR abuts bolted rail	Anchor every tie for 195 feet in each direction.
Bolted joint created during CWR installation/construction	Within 60 days from date of creation: Weld joint, OR Install joint with 6 bolts, OR Anchor every tie for 195' in both directions.

*For turnouts connected to Class 1 yard or back tracks, it is only necessary to anchor every tie to the first transition rails/joints of the diverging route.

2.3 Bridge Pattern

When installing CWR, follow these bridge anchoring requirements:

1. Ballast deck bridges should be anchored with the same pattern as in Chapter 2.1 and 2.2 of these CWR Procedures.
2. Open-deck bridge spans should be anchored as follows:
 - On open-deck timber bridges, apply anchors to all ties fastened to the stringers.
 - On open-deck steel spans 150 feet long or less, apply anchors to all ties fastened to the steel structure.
 - On all other structures, apply anchors as directed by the Director Bridge Engineering

Maintenance or Rail Repair

2.4 Legacy Patterns

On CWR installations completed before September 21, 1998, existing anchoring may remain if rail is restrained to prevent track buckles. Rail must be adjusted (by increasing or decreasing the length of rail or by lining curves) or anchors added to rail, if restraint is not sufficient.

2.5 Anchor Requirements After Rail Repair

When rail repairs result in a joint added to CWR, the anchor pattern shall match the existing pattern in track. Box anchor at least every other tie for a distance of 195 feet in each direction, unless anchoring is otherwise provided. When making repairs to a stripped joint or failed joint bar, adjust or add anchors as prescribed in the following table.

Condition	Action
Bolted joint in CWR experiencing service failure (stripped joint) or failed bar(s) with gap* present. *gap exists if it cannot be closed by drift pin.	<ol style="list-style-type: none"> 1. Weld joint, OR 2. Remediate joint conditions (per Chapter 6.5 CWR) and replace bolts (new, in-kind or stronger), and weld joint within 30 days, OR 3. Replace failed bar(s), install 2 additional bolts, and adjust anchors OR 4. Replace bars, bolts (if failed or missing) and anchor every tie for 195' in both directions OR 5. Add rail (documenting provisions for later adjustments, if applicable) and reapply anchors.

Chapter 3 Preventive Maintenance on Existing CWR Track

Performing track buckling preventive maintenance procedures to properly maintain the RNT reduces the risk of buckles in hot weather as well as pull-a parts and broken rails in cold weather. When tight rail conditions exist, be governed by Chapter 7.1 of these CWR Procedures.

3.1 Maintaining Desired Rail Installation Temperature Range

A record of rail neutral temperature will be maintained where rail has pulled apart, broken, or been cut.

Rail that has pulled apart, broken, or has been cut must be adjusted into a safe zone defined as the Target Neutral Temperature (TNT) $\pm 20^{\circ}$ F for that location. Refer to Target Rail Laying Temperatures (Chapter 1.1 above) for the TNT for your location.

Exception: if actual rail temperature results in a rail neutral temperature above the safe zone, the rail does not need to be subsequently adjusted unless evaluation of location identifies conditions significantly reducing lateral strength or longitudinal restraint – record a work order for subsequent readjustment if such conditions are identified.

If the rail has not been readjusted prior to the rail temperature exceeding the values in the table below, a speed restriction not to exceed 25 MPH will be placed. A speed restriction of 40 MPH can be placed in lieu of the 25 MPH, but the track must be inspected daily during the heat of the day. As you can see from the table below, if the rail temperature at the time of break or pull-apart exceeded 60° F, no slow order is necessary.

Rail Temperature Recorded at Time of Break or Pull-Apart ($^{\circ}$ F)	Readjust or Place Slow Order Before Rail Temperature Reaches ($^{\circ}$ F)
60	135
50	130
40	125
30	120
20	115
10	110
0	105
-10	100
-20	95
-30	90
-40	85

Note: If both rails are cut (e.g., installing a short track panel), the above table will not apply. The adjustments, slow orders, and inspections described above will instead apply at a rail temperature 70° F above lowest rail temperature at time of separations.

Effective January 1, 2010, locations where the neutral temperature has been lowered below the safe zone must be adjusted to TNT minus 20° F or higher within 365 days or restrict to a speed not exceeding 15 mph and when rail temperatures exceed TNT- 20° F inspect weekly.

The Electronic Task Reporting System (ETRS) will automatically monitor all reported CWR attributes to ensure a location is restored to within its safe zone. If an area is not restored, a CWR Adjustment order will be generated.

If a CWR Adjustment order does not exist for a location, the pull chart or CWR calculator

may be used to determine the amount of rail to remove. If a CWR Adjustment order exists for a location, either remove the required amount shown or destress the location.

Use match marks to determine GAP and Pull values to report in ETRS for each CWR adjustment work activity. Use existing match marks vs creating new ones whenever possible. Match marks should be:

- Made outside of the rail section to be repaired or removed.
- On the field side of the rail using a ball-point paint marker
- A sufficient distance from any planned cuts or drilled holes in the rail to allow room for rail joint and weld documentation
- A whole number of feet apart
- If placing the original match marks, write the original distance between the match marks on the web of the rail next to both match marks. The markings should not be between the match marks.
 - If the rail is not broken/cut, simply measure the distance between the two match marks before cutting the rail
 - If the rail is broken, measure a whole foot distance from each rail end and place the match mark. Double that distance when writing the original match mark distance on the rail.

Follow these steps to determine GAP and PULL.

1. Prior to any work occurring, measure the starting distance between the match marks
2. Determine rail end movement and rail temp at time of repair as follows:
 - a. Amount rail moves apart at cut/break = + Gap
 - b. Amount rail grows together on its own at cut/break = - GAP
 - c. Amount rail pulls together as result of work (puller, rail consumption for weld,etc) = PULL
 - d. Rail temp is taken at the time of the initial cut or when the repairs are made for a broken rail
3. If the repair includes a weld(s), trim the necessary amount of rail so that no rail is added as a result of the welds. Since the match marks do not move (example: trim 1" and add back in 1" of rail with the weld), this is not recorded as a GAP or a PULL.

Document on the field side of the rail using ball-point paint marker - Rail Temperature, Gap, Pull, Date

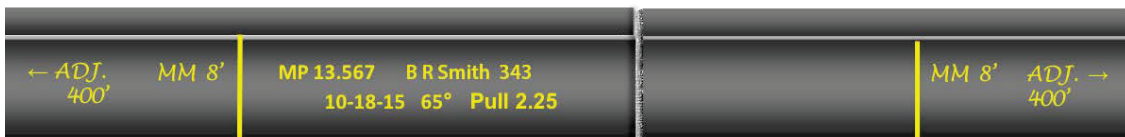
Record in ETRS Rail Temperature, Date, Location, Gap, Pull. If work not performed under an existing CWR Adjustment Order also record Tie and anchor or fastener method, Track Strength.

3.2 Destressing Rail

Rail can be destressed by cutting rail out. When cutting rail out, use this procedure:

1. Cut rail to be destressed.

2. Remove or reposition anchors or clips for a minimum of 200 feet in both directions from the cut or up to a restriction that prevents rail movement.
3. Wait until the rails stop moving. The rail ends may need to be trimmed more than one time to allow for expansion.
4. Make match marks on either side of the cut after the unrestrained rail is relaxed.
5. Take the rail temperature (far enough away from the cut so that the reading is not affected by the cutting procedure).
6. Use Table 6-3 in the Appendix of these CWR Procedures to compare the rail temperature with the Target Neutral Temperature (TNT) for the territory. The difference between the two is known as the temperature differential.
7. If the actual rail temperature is lower than the TNT for the territory, use Table 6-3, in the Appendix to determine the rail length to be removed based on the total distance the anchors or clips have been removed.
8. If the rail temperature is at or above the TNT, no additional adjustments are needed. When destressing rail near fixed objects, destress each rail to a temperature that is 10 degrees higher than the TNT.
9. Weld the joint or apply joint bars.
10. Replace the rail anchors or clips.
11. Document on the rail match marks, employee name, date work performed, rail temperature at time of adjustment, amount of rail added or removed (PULL) per Table 6-3 (see Appendix), and feet of rail adjusted. Example is shown below:
12. Report the work in ETRS.



Chapter 4 Monitoring Curve Movement Following Track Disturbance Work Activities

4.1 Staking of Curves

At a minimum all curves 2 degrees and greater on main tracks shall be staked prior to any out of face track disturbance work activities involving tie renewal, undercutting, or surfacing.

To stake a curve prior to any track disturbance work, place one stake at each spiral to curve point—PSC (approximate the location), and place at least one stake in the full body of the curve. If placing only one, place it near the middle of the curve. On longer curves, place stakes no more than 400 feet apart.

4.2 Inspecting for Curve Movement

Curve offset measurements should be taken prior to the work to be performed. Record offset measurements and check them again after the curve has been worked. Track Inspector and Roadmaster shall reference offset measurements so the curve can be monitored during subsequent inspections.

Inspect curve movement periodically after the work, especially during periods of large temperature changes. Curves that have been disturbed during night work must be inspected the following day when rail temperatures meet and exceed that area's TNT. Where the curve has been staked as described above and the curve has shifted inward more than 2 inches, the Roadmaster will ensure that a work order is created and the curve lined out prior to the rail temperatures exceeding those in the table in Chapter 3.1 of these CWR Procedures. If the curve is not lined out, place a speed restriction according to the table in Chapter 3.1, or distress rail. For speed restrictions, note the temperature at which the curve moved and restrict the speed at the temperature listed in the second column of the table. When tight rail conditions exist, be governed by Chapter 7.1 of these CWR Procedures.

Chapter 5 Placing Temporary Speed Restrictions Account Disturbed Track

A temporary speed restriction should be placed anytime the roadbed or ballast section is disturbed as required in Chapter 5.4 of these CWR Procedures, except where the maximum authorized speed of the track is equal to or less than the required restriction.

5.1 General Requirements

Restoring the consolidation and lateral resistance of the disturbed track structure following many work activities is critical to the safe operation of trains. Trains and/or Dynamic Track Stabilizers are used to restore ballast consolidation through compaction.

5.2 Responsibility for Placing Speed Restrictions

During the work or before returning the track to service, the Supervisor or Foreman in charge must ensure that:

- Gage, surface, and alignment have been established.
- Crib and shoulder ballast is in place or lateral constraint is otherwise provided.
- The rail is anchored per Chapter 2 of these CWR Procedures.

5.3 Speed Restriction Length

Speed restrictions must cover the entire area affected by the track work. If conditions warrant, extend the restrictions by at least 0.2 miles in each direction. Conditions include:

- High rail temperatures
- Recently disturbed track
- Grades
- Approaches to fixed objects
- Sharp curves

5.4 Speed Restrictions for Track Work

Table 4-2 specifies the minimum requirements for temporary speed restrictions for work activities that disturb the ballast section. If conditions warrant, use a more restrictive speed and/or duration.

The duration for a restriction as required by Table 4-2 may be determined by counting qualifying trains, actual accumulated tonnage measured by Train Management System, or duration in days; whichever is less

As used in Table 4-2, "Trains" refers to Qualifying Trains defined as trains consisting of at least 30 cars or 2,000 tons. Only passenger trains may be counted as partial trains equivalent to their car count or where their tonnage can be divided by 2,000 (Ex. Passenger train of 400 tons is equivalent to 0.20 qualifying train; Passenger train of 5 cars is equivalent to 1/6 qualifying train) and can be added to other passenger trains. Any single train with tonnage >15,000 tons may be counted as 2 qualifying trains..

Table 4-2. Temporary Speed Restrictions for Track Work.

Speed Requirements for Consolidation After Work Is Completed					
Work Activity	Max. Rail Temp. Reached or Predicted for Duration to Operate Qualifying Trains, 0.1 MGT or 5 Days ¹	15 MPH ²	30 MPH	45 MPH	Total Number of Trains Before Max. Authorized Speed
Spot and out-of-face work activities involving tie renewal, undercutting, and/or surfacing without Dynamic Track Stabilizer ³	TNT +20° F and over	6 ⁴	4	10	20
	TNT +5° F to TNT +19° F	2 ⁵	8	10	20
	TNT -19° F to TNT +4° F	0	5	5	10
	TNT -20° F and under	0	2	0	2
Ballast shoulder cleaning (with shoulder ballast restored)	TNT +5° F and over	0	0	2	2
Spot and out-of-face surfacing with Dynamic Track Stabilizer	TNT +5° F and over	1	2	0	3
	TNT +4° F and under	0	2	0	2
Spot surfacing of low rail joint (not to exceed 8 ties or 2 joints within 10 ft.) where it is known that the rail is not in compression ⁶	TNT and over	0	2	0	2
Panel track (due to washout, embankment failure, derailment, or roadbed construction) ⁷	TNT +20° F and over	2	8 ⁷	10	20
	TNT +19° F and under	1	9 ⁷	10	20
Spot and out-of-face undercutting without surfacing	1 train at 15 MPH. If track is OK, then 30 MPH until surfaced.				
New track construction with engineered roadbed	Same requirements as panel track unless rail has been destressed.				

Note: Number of qualifying trains listed under each specific speed is the minimum allowed before raising the speed to the next level listed. Additional trains can be run at a lower speed. Once the total number of qualifying trains, 0.1 MGT, or 5 days has been reached, regardless of speed, then the temporary speed restriction may be removed.

¹ Whichever is less. This refers to the tonnage or number of trains required to operate over the disturbed track location. It does not infer at what speed. If 5 days is reached before the sufficient tonnage or number of trains has passed, then an inspection is required prior to removing the speed restriction, and the number of trains or tonnage must be considered.

² Verify track is OK before raising speed above 15 MPH when the rail temp is TNT +5° F and over.

³ For spot work activities not exceeding 500 track feet, only one-half of the minimum number of trains are required for stabilization purposes when the Foreman in charge knows that neither rail is in compression at TNT. To determine this, cut and adjust the rail per Engineering Instruction 6 Rail, specifically section 6.2, if working in CWR territory. In bolted rail territory, loosen the joint bars and observe that the expansion gaps are present between the rail ends. This provision does not apply where rail temperature may exceed 125° F during the time it takes to operate 20 qualifying trains or 5 days, whichever is less.

⁴ Verify track is OK behind each of the first two trains. If there is an extended delay in waiting for the second train at 15 MPH for purpose of inspection, then the inspection may be delayed, and the 15 MPH may be left on for additional trains overnight with Division Engineer approval. If the rail temperature drops below TNT +20° F at any time after verifying the track is OK behind the second train, then the speed may be increased to 30 MPH for the remaining trains and their count must be added to the required minimum trains at 30 MPH.

⁵ Verify track is OK behind the first train. If the rail temperature drops below TNT +5° F before the second train traverses the limits, then the speed may be increased to 30 MPH and its count must be added to the required minimum trains at 30 MPH.

⁶ To determine if rail is not in compression at the rail joint, remove joint bars or loosen all bolts in the joint. Then, observe if a gap exists between the rail ends. You also can determine this while making a thermite weld to eliminate the rail joint.

⁷ Track speed cannot be raised above 30 MPH unless conditions in Table 4-3 are satisfied.

During the time of day when the sun cannot be a factor in elevating rail temperatures, the following exception will apply to Table 4-2 Temporary Speed Restrictions for Track Work:

EXCEPTION: If a compaction speed restriction is in effect and the rail temperature remains above the threshold temperature, continue to adhere to the requirements of Table 4-2.

- If the temperature drops below the threshold temperature, any compaction slow order for work done without a Dynamic Track Stabilizer that has previously been raised to 30 MPH in accordance with Table 4-2 may be raised or removed between the hours of 2200-0900.
- The speed restriction may remain modified or removed if the required 100,000 tons or number of trains, as originally required in Table 4-2, have passed over the affected segment of track during the period of time the rail temperature dropped below the threshold.
- At 0900, or if the rail temperature rises to or above the threshold, and the 100,000 tons or number of trains originally required for compaction in Table 4-2 have not passed, re-establish the speed restriction. The restriction must remain in place until the required 100,000 tons or number of trains originally required by Table 4-2 have passed.

Table 4-3. Temporary Speed Restrictions for Lowered Rail Neutral Temperature Locations Based on Rail Temperature and Original Work Date.

Track Type	Speed Restriction Requirements Based on Required Rail Removal Date (date predicted first occurrence of rail temperatures exceeding Section 3.1)		1 Year After Original Work Date
	Before Date	On and After Date	
CWR location where rail has pulled apart, broken or been cut resulting in neutral temperature lower than 20° F below TNT	N/A	25 MPH or 40 MPH with daily inspection	Restrict to 15 MPH and Inspect weekly when rail temperatures exceed TNT-20° F
Panels, Square Joints ¹	40 MPH	30 MPH or 45 MPH with daily inspection	Restrict to 15 MPH
Panels, Staggered Joints ¹	N/A	30 MPH or 45 MPH with daily inspection	Restrict to 15 MPH
Panels, Square, Destressed ¹		45 MPH	Restrict to 15 MPH
Panels, Staggered, Destressed ¹		N/A	Restrict to 15 MPH

¹ Note: Refer to table 4-2 for Temporary speed restrictions specific to stabilizing track panels

Chapter 6 Rail Joint Inspections

CWR joint means: (a) any joint directly connected to CWR, and (b) any joint(s) in a segment of rail between CWR strings that are less than 195 feet apart, except joints located on jointed sections on bridges.

6.1 Class of Track

All CWR joints within the following classes must be inspected on foot:

- Class 2 on which passenger trains operate
and
- Class 3 and higher

6.2 Frequency of Inspections

CWR joints shall be inspected on foot at the following minimum frequencies:

Minimum Number of Inspections Per Calendar Year ¹					
	Freight trains operating over track with an annual tonnage of:			Passenger trains operating over track with an annual tonnage of:	
	Less than 40 mgt	40 to 60 mgt	Greater than 60 mgt	Less than 20 mgt	Greater than or equal to 20 mgt
Class 5 & above	2x	3x ²	4x ²	3x ²	3x ²
Class 4	2x	3x ²	4x ²	2x	3x ²
Class 3	1x	2x	2x	2x	2x
Class 2	0	0	0	1x	1x
Class 1	0	0	0	0	0
Excepted Track	0	0	0	n/a	n/a

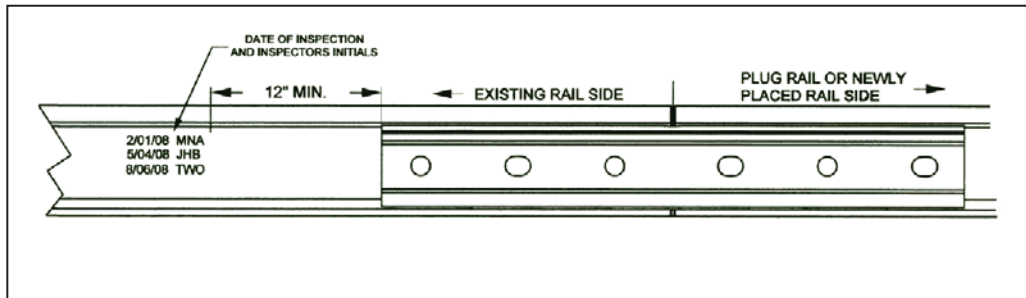
4x = Four times per calendar year, with one inspection in each of the following periods: January to March, April to June, July to September, and October to December; and with consecutive inspections separated by at least 60 calendar days. 3x = Three times per calendar year, with one inspection in each of the following periods: January to April, May to August, and September to December; and with consecutive inspections separated by at least 90 calendar days. 2x = Twice per calendar year, with one inspection in each of the following periods: January to June and July to December; and with consecutive inspections separated by at least 120 calendar days. 1x = Once per calendar year, with consecutive inspections separated by at least 180 calendar days.

¹ Where a track owner operates both freight and passenger trains over a given segment of track, and there are two different possible inspection interval requirements, the more frequent inspection interval applies.

² When extreme weather conditions prevent a track owner from conducting an inspection of a particular territory within the required interval, the track owner may extend the interval by up to 30 calendar days from the last day that the extreme weather condition prevented the required inspection.

6.3 Identification of Joints

Each CWR joint requiring action as outlined in Chapter 6.5 of these CWR Procedures shall be identified in the field with a highly visible marking. In addition, such joints shall also be identified as to location by specifying the subdivision, mile post, track number, and rail (north, south, etc.) See Marking Rail Following Periodic Inspections of Rail Joints for additional instructions on marking joints (shown below).



6.4 Switches, Track Crossings, Lift Rail Assemblies, or Other Transition Devices on Moveable Bridges

Joints within or adjacent to switches, track crossings, lift rail assemblies, or other transition devices on moveable bridges are exempt from the periodic joint inspection requirements provided they are inspected monthly during the required monthly walking inspection of these devices.

Therefore, inspect these locations on a minimum monthly basis and include in the inspection and report on the following:

At switches:

- All joints from and including the insulated joints at the signals governing movement entering and leaving the control point or interlocking.
- If there are no signals at the switch location, include as a minimum all joints from the point of the switch to the heel of the frog.

At cross-overs:

- All joints in track between switches.

At track crossings:

- All joints from and including the insulated joints at the signals governing movement entering and leaving the control point or interlocking.
- If there are no signals at the track crossings, include as a minimum all joints that are between or connected to the crossing frogs.

At lift rail assemblies or other transition devices on moveable bridges:

- All joints immediately attached to the rail assembly or transition device.

6.5 Rail Joint Conditions

When inspecting CWR joints on foot in track listed in Chapter 6.1 of these CWR Procedures, inspectors must watch for (but not be limited to) the following rail joint conditions outlined in the table below. When such conditions are found, the appropriate action must be taken as outlined.

Rail Joint Condition	Action¹
Visible cracks in joint bar	Replace bar
Loose bolts	Tighten bolts
Bent bolts	Replace bolts OR Re-inspect as per Chapter 6.2
Missing bolts ²	Replace bolts
Broken or missing tie plate(s)	Replace tie plate(s) OR Conduct follow-up inspections every other week until repaired/replaced
Tie(s) not effectively supporting joint	Tamp tie(s) Replace or repair tie(s) OR Conduct follow-up inspections every other week until repaired / removed
Deteriorated insulated joint	Replace / repair joint OR Conduct follow-up inspections every other week until repaired / removed
Rail-end batter (More than 3/8" in depth and more than 6" in length measured with a 24" straight-edge)	Repair by welding the joint or removing rail OR Conduct follow-up inspections every other week until repaired / removed
Rail-end mismatch reaches limits specified by 49 FRA 213.115	Weld or grind
Longitudinal rail movement greater than 2"	Add or adjust rail anchors, tighten bolts, add or remove rail at appropriate time, OR Conduct follow-up inspections every other week until repaired / removed
Wide rail gap greater than 1.5"	Adjust rail gap and secure joint OR Conduct follow-up inspections every other week until repaired / removed
Joint vertical movement (profile) that exceeds 75% of the allowable threshold for the designated class of track ³	Surface joint OR Conduct follow-up inspections every other week until repaired / removed
Fouled ⁴ ballast present in conjunction with joint vertical movement (profile) that exceeds 75% of the allowable threshold for the designated class of track	Surface joint and provide drainage OR Conduct follow-up inspections every other week until repaired / removed
Joint lateral movement (in a curve or spiral) that reaches 3/4" ³	Correct lateral movement OR Conduct follow-up inspections every other week until repaired / removed

¹ Action may also consist of placing a speed restriction or removing the track from service.

² A minimum of 2 bolts per rail must be in place at each joint.

³ Joint lateral and vertical movement is the apparent visible movement measured at the joint.

⁴ Fouled ballast is defined as ballast that is so contaminated with fines that it is containing standing water within the track structure at joints.

6.6 Embedded Joints

Permanently Embedded Locations

Where such locations exist, it is not necessary to disassemble or remove the track structure (e.g., remove pavement or crossing pads) to conduct an inspection of CWR joints. Make every effort, to the extent practicable, to inspect the visible portion of joints in these structures.

Temporarily Buried Locations

Joints may sometimes be temporarily buried (e.g., where ballast or similar material is in the middle of the track and along the track) and therefore unavailable for inspection. Where CWR joints are buried (e.g., by ballast), wait for the completion of the track work before conducting joint bar inspections. Locations that have been buried for an extended period of time must still be inspected. Joints buried more than 5 months are no longer considered temporary.

6.7 Inspection Records

On-Foot Periodic and Follow-up Inspection Reports

Initial and date the web of the rail at the joint after each inspection. Document in ETRS each on-foot periodic and follow-up inspection on the date of the inspection by noting the following information:

- Date
- Limits of the inspection
- Location and nature of CWR joint conditions specified in Chapter 6.5 of these CWR Procedures
- Corrective or remedial action
- Name and signature of Inspector

Chapter 7 Extreme Weather Inspections

For purposes of forecasting or initiating extreme weather inspections and conversions of rail temperatures to ambient temperatures, use the following:

- In hot weather rail temperature is equal to ambient (air) temperature plus 30° F.
- In cold weather rail temperature is equal to ambient temperature.

7.1 Hot Weather Inspections

On main tracks, hot weather inspections must be performed as directed by the Division Engineer or General Director Maintenance or when the temperature is expected to exceed the threshold temperature for the territory. Threshold ambient temperatures, if any, and mile post limits can be found in section 1-D of the timetable for those subdivisions affected.

Perform inspections during the heat of the day—primarily between 12 noon and 6 p.m. Inspectors will inspect for signs of tight rail conditions, including:

- Kinky or wavy rail
- Rail canting or lifting out of tie plates
- Shiny marks on the base of the rail indicating that the rail is running through the anchors and the spikes
- Gaps in ballast at the ends of ties
- Churning ballast and ties

When tight rail conditions are present such as above, a speed restriction of 25 MPH or less must be placed on track removed from service until repair or adjustment is made.

Inspectors should pay special attention to:

- Recently disturbed track
- Track at the bottom of sags
- Locations where heavy braking occurs
- Fixed track structures, such as turnouts and bridges
- Locations where rail has been repaired or welds made

7.2 Cold Weather Inspections

On main tracks, cold weather inspections must be performed as directed by the Division Engineer or General Director Maintenance based on the TNT and weather extremes that occur across the railroad. Accordingly, the railroad will be divided into two regions as follows:

Region 1 contains the following divisions:

California	All subdivisions
Chicago	Beardstown and Yates City subdivisions
Heartland	Afton, Amory, Birmingham, Cherokee, Cuba, Ft. Scott, Hannibal, River, Thayer North, and Thayer South subdivisions
Kansas	Arkansas City, Douglass, Emporia, Hereford, La Junta, Panhandle, Strong City, and Topeka subdivisions
Northwest	All subdivisions
Red River	All subdivisions
Southwest	All subdivisions
Montana	Kootenai River subdivision MP 44.0 to Sandpoint Jct only

Region 2 contains the following divisions:

Chicago	All subdivisions excluding Beardstown and Yates City
Heartland	Bayard, Council Bluffs, Creston, Napier, Omaha, and St. Joseph subdivisions
Kansas	Boise City, Dalhart, and Twin Peaks subdivisions
Montana	All subdivisions excluding the part of the Kootenai River subdivision from MP 44.0 to Sandpoint Jct
Powder River	All subdivisions
Twin Cities	All subdivisions

This guideline establishes the threshold temperatures that trigger special track inspections and reduced train speeds. The threshold temperatures include:

- Low levels which result in sustained extreme tensile forces
- Transition which results in extreme changes in tensile rail forces through a critical temperature zone

Special "first event" temperature thresholds are shown in a separate column and provide a guideline for implementing cold weather actions during the first significant cold weather of the season. These special guidelines were established to better respond to the more frequent service-failed rails experienced during the first significant drop in temperatures.

Low Temperature and Seasonal First Event Thresholds

	<u>Low Temperature Threshold</u>	<u>Seasonal First Event</u>
Region 1	0° F	10° F
Region 2	-20° F	0° F

When temperatures drop below the Low Temperature Threshold, a track inspection must be performed and each 24 hours thereafter until temperatures rise above the Low Temperature Threshold. On branch lines that do not have daily service, a track inspection must be performed ahead of train(s) on days service is provided.

Temperature Differential Threshold

The Temperature Differential Threshold by region is:

- Region 1 From 50° F or greater to a temperature of 10° F or less
- Region 2 From 40° F or greater to a temperature of 0° F or less

Seasonal First Event

- Region 1 From 50° F or greater to 20° F or less
- Region 2 From 40° F or greater to 10° F or less

When temperatures drop completely through the Temperature Differential Threshold within a 24- hour period or less, a track inspection must be performed. Cold weather train speeds must be observed until the track inspection is complete and track is approved by the Inspector for normal speed. (See Engineering Instruction 4.9.1 for Cold Weather Train Speeds—also included below):

Train speeds in **signalized territory** during cold weather include:

- 40 MPH for trains exceeding 100 tons per operative brake and Key trains
- 50 MPH for trains less than 100 tons per operative brake
- 65 MPH for passenger trains, Z-symbol intermodal trains, or single level loaded intermodal trains

Train speeds in **non-signalized territory** during cold weather include:

- 40 MPH for all trains

Examples:

Region 1:

<u>High</u>	<u>Low</u>	<u>Action Required</u>
90° F	61° F	None
80° F	30° F	None
30° F	8° F	Seasonal First Event Track
60° F	8° F	Cold Weather Track Inspection
Any	-1° F	Cold Weather Track Inspection

Region 2:

<u>High</u>	<u>Low</u>	<u>Action Required</u>
85° F	45° F	None
70° F	20° F	None
30° F	-5° F	Seasonal First Event Track
45° F	-5° F	Cold Weather Track Inspection
Any	-21°F	Cold Weather Track Inspection

Inspectors will inspect for:

- Broken rails
- Pull-aparts
- Curve movement
- Wide gap between rail ends
- Bent bolts
- Cracked or broken joint bars (conventional and insulated)
- Canted rail

Chapter 8 Training

8.1 Training

All employees responsible for the inspection, installation, adjustment, or maintenance of CWR track must complete training on CWR procedures every calendar year. In addition, they shall be provided a copy of these procedures and accompanying documents. A list of employees qualified to supervise restorations and inspect track in CWR territory will be maintained and will be made available to the FRA upon request. Training programs will address, but not be limited to, the following:

- CWR installation procedures
- Rail anchoring requirements
- Preventive maintenance on existing CWR track
- Monitoring curve movement following track surfacing and lining
- Placing temporary speed restrictions account track work
- Rail joint inspections
- Insufficient ballast
- Extreme weather inspections
- Recordkeeping
- Action items

Chapter 9 Recordkeeping

9.1 Report of CWR Installations

The initial rail temperature, final adjusted rail neutral temperature, location, and date of CWR installations must be recorded and must be retained for at least one year after installation.

9.2 Report Maintenance Work in CWR

Because track maintenance can disturb the lateral and longitudinal resistance of the track, records of the following must be kept for at least one year after corrections or adjustments are made:

- Record of each designated cut or break location using the adjustment methodology of Chapter 3.1, including location, rail temperature, date, rail adjustments, and final Rail Neutral Temperature.
- Record of each designated cut or break location using Destressing Rail in Chapter 3.2, including the rail temperature of the final RNT.
- Where a curve has been staked and has shifted inward more than a maximum of 2 inches.
- CWR installation or maintenance work that does not conform to these written procedures.

The Division Engineer and Roadmaster must monitor these records to ensure that necessary corrections and adjustments are made.

Appendix

Table 6-3. Change in Length of Welded Rail to Change Neutral Temperature.

Temp. Diff. (°F)	Length of Unrestrained Rail							
	200'	400'	600'	800'	1,000'	1,200'	1,400'	1,600'
5°	1/8"	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	1/2"
10°	1/8"	1/4"	1/2"	1/2"	3/4"	1"	1"	1-1/4"
15°	1/4"	1/2"	3/4"	1"	1-1/4"	1-1/2"	1-3/4"	1-3/4"
20°	1/4"	1/2"	1"	1-1/4"	1-1/2"	1-3/4"	2-1/4"	2-1/2"
25°	3/8"	3/4"	1-1/4"	1-1/2"	2"	2-1/4"	2-3/4"	3"
30°	1/2"	1"	1-1/2"	1-3/4"	2-1/4"	2-3/4"	3-1/4"	3-3/4"
35°	1/2"	1"	1-3/4"	2-1/4"	2-3/4"	3-1/4"	3-3/4"	4-1/4"
40°	5/8"	1-1/4"	1-3/4"	2-1/2"	3"	3-3/4"	4-1/4"	5"
45°	3/4"	1-1/2"	2"	2-3/4"	3-1/2"	4-1/4"	5"	5-1/2"
50°	3/4"	1-1/2"	2-1/4"	3"	4"	4-3/4"	5-1/2"	6-1/4"
55°	7/8"	1-3/4"	2-1/2"	3-1/2"	4-1/4"	5-1/4"	6"	6-3/4"
60°	7/8"	1-3/4"	2-3/4"	3-3/4"	4-3/4"	5-1/2"	6-1/2"	7-1/2"
65°	1"	2"	3"	4"	5"	6"	7"	8"
70°	1-1/8"	2-1/4"	3-1/4"	4-1/4"	5-1/2"	6-1/2"	7-3/4"	8-3/4"
75°	1-1/8"	2-1/4"	3-1/2"	4-3/4"	5-3/4"	7"	8-1/4"	9-1/4"
80°	1-1/4"	2-1/2"	3-3/4"	5"	6-1/4"	7-1/2"	8-3/4"	10"
85°	1-3/8"	2-3/4"	4"	5-1/4"	6-3/4"	8"	9-1/4"	10-1/2"
90°	1-3/8"	2-3/4"	4-1/4"	5-1/2"	7"	8-1/2"	9-3/4"	11-1/4"
95°	1-1/2"	3"	4-1/2"	6"	7-1/2"	9"	10-1/4"	11-3/4"
100°	1-1/2"	3"	4-3/4"	6-1/4"	7-3/4"	9-1/4"	11"	12-1/2"

Note: The above amounts do not allow for rail added during thermite welding nor rail removed in upset during flash-butt welding.

Rail Adjustment Pull Charts

CWR Pull Chart 6" Base - 129RE to 141RE Rail

Rail Temp	Wood Ties - Every Other Tie Anchored							Wood Ties - Every Tie Anchored or Elastic Fastener							Concrete Ties					
	Target RNT (TNT)							Target RNT (TNT)							Target RNT (TNT)					
	95	100	105	110	115	120		95	100	105	110	115	120		95	100	105	110	115	120
Not Frozen Ballast	120 or greater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	115 to 119	0	0	0	0	0	0.25	0	0	0	0	0	0.25	0	0	0	0	0	0	0.25
	110 to 114	0	0	0	0	0.25	0.25	0	0	0	0	0.25	0.25	0	0	0	0	0.25	0.25	0.25
	105 to 109	0	0	0	0.25	0.25	0.25	0	0	0	0.25	0.25	0.25	0	0	0	0.25	0.25	0.25	0.25
	100 to 104	0	0	0.25	0.25	0.25	0.5	0	0	0.25	0.25	0.25	0.25	0	0	0.25	0.25	0.25	0.25	0.25
	95 to 99	0	0.25	0.25	0.25	0.5	0.75	0	0.25	0.25	0.25	0.25	0.25	0.5	0	0.25	0.25	0.25	0.25	0.5
	90 to 94	0.25	0.25	0.25	0.5	0.75	1	0.25	0.25	0.25	0.25	0.5	0.75	0.25	0.25	0.25	0.25	0.25	0.5	0.5
	85 to 89	0.25	0.25	0.5	0.75	1	1.25	0.25	0.25	0.25	0.5	0.75	0.75	0.25	0.25	0.25	0.5	0.5	0.5	0.75
	80 to 84	0.25	0.5	0.75	1	1.25	1.5	0.25	0.25	0.5	0.75	0.75	1	0.25	0.25	0.5	0.5	0.75	1	1.25
	75 to 79	0.5	0.75	1	1.25	1.5	1.75	0.25	0.5	0.75	0.75	1	1.25	0.25	0.5	0.5	0.75	1	1.25	1.5
	70 to 74	0.75	1	1.25	1.5	1.75	2.25	0.5	0.75	0.75	1	1.25	1.75	0.5	0.5	0.75	1	1.25	1.5	1.75
	65 to 69	1	1.25	1.5	1.75	2.25	2.75	0.75	0.75	1	1.25	1.75	2	0.5	0.75	1	1.25	1.5	1.75	2
	60 to 64	1.25	1.5	1.75	2.25	2.75	3.25	0.75	1	1.25	1.75	2	2.25	0.75	1	1.25	1.5	1.75	2	2.5
	55 to 59	1.5	1.75	2.25	2.75	3.25	3.75	1	1.25	1.75	2	2.25	2.75	1	1.25	1.5	1.75	2	2.5	2.5
	50 to 54	1.75	2.25	2.75	3.25	3.75	4.25	1.25	1.75	2	2.25	2.75	3	1.25	1.5	1.75	2	2.5	2.5	2.75
	45 to 49	2.25	2.75	3.25	3.75	4.25	5	1.75	2	2.25	2.75	3	3.5	1.5	1.75	2	2.5	2.75	3.25	3.25
	40 to 44	2.75	3.25	3.75	4.25	5	5.5	2	2.25	2.75	3	3.5	4	1.75	2	2.5	2.75	3.25	3.5	3.5
	35 to 39	3.25	3.75	4.25	5	5.5	6.25	2.25	2.75	3	3.5	4	4.5	2	2.5	2.75	3.25	3.5	4	4
	30 to 34	3.75	4.25	5	5.5	6.25	7	2.75	3	3.5	4	4.5	5	2.5	2.75	3.25	3.5	4	4.5	4.5
	25 to 29	4.25	5	5.5	6.25	7	7.75	3	3.5	4	4.5	5	5.75	2.75	3.25	3.5	4	4.5	5	5
20 to 24	5	5.5	6.25	7	7.75	8.75	3.5	4	4.5	5	5.75	6.25	3.25	3.5	4	4.5	5	5.5	5.5	
15 to 19	5.5	6.25	7	7.75	8.75	9.5	4	4.5	5	5.75	6.25	6.75	3.5	4	4.5	5	5.5	6	6	
10 to 14	6.25	7	7.75	8.75	9.5	10.5	4.5	5	5.75	6.25	6.75	7.5	4	4.5	5	5.5	6	6.5	6.5	
5 to 9	7	7.75	8.75	9.5	10.5	11.5	5	5.75	6.25	6.75	7.5	8.25	4.5	5	5.5	6	6.5	7.25	7.25	
0 to 4	7.75	8.75	9.5	10.5	11.5	12.5	5.75	6.25	6.75	7.5	8.25	9	5	5.5	6	6.5	7.25	7.75	7.75	
Frozen Ballast	40 to 44	1.5	1.75	2	2.25	2.5	2.75	1	1.25	1.5	1.5	1.75	2	1	1	1.25	1.5	1.75	1.75	
	35 to 39	1.75	2	2.25	2.5	2.75	3.25	1.25	1.5	1.5	1.75	2	2.25	1	1.25	1.5	1.75	1.75	2	
	30 to 34	2	2.25	2.5	2.75	3.25	3.5	1.5	1.5	1.75	2	2.25	2.5	1.25	1.5	1.75	1.75	2	2.25	
	25 to 29	2.25	2.5	2.75	3.25	3.5	4	1.5	1.75	2	2.25	2.5	3	1.5	1.75	1.75	2	2.25	2.5	
	20 to 24	2.5	2.75	3.25	3.5	4	4.5	1.75	2	2.25	2.5	3	3.25	1.75	1.75	2	2.25	2.5	2.75	
	15 to 19	2.75	3.25	3.5	4	4.5	4.75	2	2.25	2.5	3	3.25	3.5	1.75	2	2.25	2.5	2.75	3	
	10 to 14	3.25	3.5	4	4.5	4.75	5.25	2.25	2.5	3	3.25	3.5	3.75	2	2.25	2.5	2.75	3	3.25	
	5 to 9	3.5	4	4.5	4.75	5.25	5.75	2.5	3	3.25	3.5	3.75	4.25	2.25	2.5	2.75	3	3.25	3.75	
	0 to 4	4	4.5	4.75	5.25	5.75	6.25	3	3.25	3.5	3.75	4.25	4.5	2.5	2.75	3	3.25	3.75	4	

Instructions:

1. This chart specifies removal amounts to field-adjust locations where the neutral temperature has been affected when CWR is cut or broken.
2. Use this table only to avoid having to return for rail adjustment at a later date. **If a CWR rail removal work order exists for the location, remove the amount of rail specified in the work order.**
3. Match up the measured rail temperature on the left-hand column with the tie type and Target RNT on the top row. The intersecting number is the pull amount, in inches, to restore rail to the desired neutral temperature and avoid an additional work order.
4. If the rail adjustment location is **within 400 feet of a fixed object** (turnout, grade crossing, open deck bridge, or diamond), then the chart does not apply - utilize rail adjustment App or rail removal work order to determine proper adjustment taking proximity to fixed object into consideration.

CWR Pull Chart 5 1/2" Base - 110RE to 119RE Rail

		Wood Ties - Every Other Tie Anchored						Wood Ties - Every Tie Anchored or Elastic Fasteners						Concrete Ties					
		Target RNT (TNT)						Target RNT (TNT)						Target RNT (TNT)					
Rail Temp		95	100	105	110	115	120	95	100	105	110	115	120	95	100	105	110	115	120
Not Frozen Ballast	120 or greater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	115 to 119	0	0	0	0	0	0.25	0	0	0	0	0	0.25	0	0	0	0	0	0.25
	110 to 114	0	0	0	0	0.25	0.25	0	0	0	0	0.25	0.25	0	0	0	0	0.25	0.25
	105 to 109	0	0	0	0.25	0.25	0.25	0	0	0	0.25	0.25	0.25	0	0	0	0.25	0.25	0.25
	100 to 104	0	0	0.25	0.25	0.25	0.5	0	0	0.25	0.25	0.25	0.25	0	0	0.25	0.25	0.25	0.25
	95 to 99	0	0.25	0.25	0.25	0.5	0.5	0	0.25	0.25	0.25	0.25	0.5	0	0.25	0.25	0.25	0.25	0.5
	90 to 94	0.25	0.25	0.25	0.5	0.5	0.75	0.25	0.25	0.25	0.25	0.5	0.5	0.25	0.25	0.25	0.25	0.5	0.5
	85 to 89	0.25	0.25	0.5	0.5	0.75	1	0.25	0.25	0.25	0.5	0.5	0.75	0.25	0.25	0.25	0.5	0.5	0.75
	80 to 84	0.25	0.5	0.5	0.75	1	1.25	0.25	0.25	0.5	0.5	0.75	1	0.25	0.25	0.5	0.5	0.75	0.75
	75 to 79	0.5	0.5	0.75	1	1.25	1.5	0.25	0.5	0.5	0.75	1	1.25	0.25	0.5	0.5	0.75	0.75	1
	70 to 74	0.5	0.75	1	1.25	1.5	2	0.5	0.5	0.75	1	1.25	1.5	0.5	0.5	0.75	0.75	1	1.25
	65 to 69	0.75	1	1.25	1.5	2	2.25	0.5	0.75	1	1.25	1.5	1.75	0.5	0.75	0.75	1	1.25	1.5
	60 to 64	1	1.25	1.5	2	2.25	2.75	0.75	1	1.25	1.5	1.75	2	0.75	0.75	1	1.25	1.5	1.75
	55 to 59	1.25	1.5	2	2.25	2.75	3.25	1	1.25	1.5	1.75	2	2.25	0.75	1	1.25	1.5	1.75	2
	50 to 54	1.5	2	2.25	2.75	3.25	3.75	1.25	1.5	1.75	2	2.25	2.75	1	1.25	1.5	1.75	2	2.25
	45 to 49	2	2.25	2.75	3.25	3.75	4.25	1.5	1.75	2	2.25	2.75	3	1.25	1.5	1.75	2	2.25	2.75
	40 to 44	2.25	2.75	3.25	3.75	4.25	4.75	1.75	2	2.25	2.75	3	3.5	1.5	1.75	2	2.25	2.75	3
	35 to 39	2.75	3.25	3.75	4.25	4.75	5.25	2	2.25	2.75	3	3.5	3.75	1.75	2	2.25	2.75	3	3.25
	30 to 34	3.25	3.75	4.25	4.75	5.25	6	2.25	2.75	3	3.5	3.75	4.25	2	2.25	2.75	3	3.25	3.75
	25 to 29	3.75	4.25	4.75	5.25	6	6.5	2.75	3	3.5	3.75	4.25	4.75	2.25	2.75	3	3.25	3.75	4.25
20 to 24	4.25	4.75	5.25	6	6.5	7.25	3	3.5	3.75	4.25	4.75	5.25	2.75	3	3.25	3.75	4.25	4.5	
15 to 19	4.75	5.25	6	6.5	7.25	8	3.5	3.75	4.25	4.75	5.25	5.75	3	3.25	3.75	4.25	4.5	5	
10 to 14	5.25	6	6.5	7.25	8	8.75	3.75	4.25	4.75	5.25	5.75	6.25	3.25	3.75	4.25	4.5	5	5.5	
5 to 9	6	6.5	7.25	8	8.75	9.5	4.25	4.75	5.25	5.75	6.25	7	3.75	4.25	4.5	5	5.5	6	
0 to 4	6.5	7.25	8	8.75	9.5	10.5	4.75	5.25	5.75	6.25	7	7.5	4.25	4.5	5	5.5	6	6.5	
Frozen Ballast	40 to 44	1.25	1.5	1.75	2	2.25	2.5	1	1	1.25	1.5	1.5	1.75	0.75	1	1	1.25	1.5	1.5
	35 to 39	1.5	1.75	2	2.25	2.5	2.75	1	1.25	1.5	1.5	1.75	2	1	1	1.25	1.5	1.5	1.75
	30 to 34	1.75	2	2.25	2.5	2.75	3	1.25	1.5	1.5	1.75	2	2.25	1	1.25	1.5	1.5	1.75	2
	25 to 29	2	2.25	2.5	2.75	3	3.25	1.5	1.5	1.75	2	2.25	2.5	1.25	1.5	1.5	1.75	2	2.25
	20 to 24	2.25	2.5	2.75	3	3.25	3.75	1.5	1.75	2	2.25	2.5	2.75	1.5	1.5	1.75	2	2.25	2.25
	15 to 19	2.5	2.75	3	3.25	3.75	4	1.75	2	2.25	2.5	2.75	3	1.5	1.75	2	2.25	2.25	2.5
	10 to 14	2.75	3	3.25	3.75	4	4.5	2	2.25	2.5	2.75	3	3.25	1.75	2	2.25	2.25	2.5	2.75
	5 to 9	3	3.25	3.75	4	4.5	4.75	2.25	2.5	2.75	3	3.25	3.5	2	2.25	2.25	2.5	2.75	3
	0 to 4	3.25	3.75	4	4.5	4.75	5.25	2.5	2.75	3	3.25	3.5	3.75	2.25	2.25	2.5	2.75	3	3.25

Instructions:

1. This chart specifies removal amounts to field-adjust locations where the neutral temperature has been affected when CWR is cut or broken.
2. Use this table only to avoid having to return for rail adjustment at a later date. **If a CWR rail removal work order exists for the location, remove the amount of rail specified in the work order.**
3. Match up the measured rail temperature on the left-hand column with the tie type and Target RNT on the top row. The intersecting number is the pull amount, in inches, to restore rail to the desired neutral temperature and avoid an additional work order.
4. If the rail adjustment location is **within 400 feet of a fixed object** (turnout, grade crossing, open deck bridge, or diamond), then the chart does not apply - utilize rail adjustment App or rail removal work order to determine proper adjustment taking proximity to fixed object into consideration.

CWR Pull Chart 100 lb and Smaller Rail Sections

		Wood Ties - Every Other Tie Anchored						Wood Ties - Every Tie Anchored or Elastic Fasteners					
		Target RNT (TNT)						Target RNT (TNT)					
Rail Temp		95	100	105	110	115	120	95	100	105	110	115	120
Not Frozen Ballast	120 or greater	0	0	0	0	0	0	0	0	0	0	0	0
	115 to 119	0	0	0	0	0	0.25	0	0	0	0	0	0.25
	110 to 114	0	0	0	0	0.25	0.25	0	0	0	0	0.25	0.25
	105 to 109	0	0	0	0.25	0.25	0.25	0	0	0	0.25	0.25	0.25
	100 to 104	0	0	0.25	0.25	0.25	0.25	0	0	0.25	0.25	0.25	0.25
	95 to 99	0	0.25	0.25	0.25	0.25	0.5	0	0.25	0.25	0.25	0.25	0.5
	90 to 94	0.25	0.25	0.25	0.25	0.5	0.75	0.25	0.25	0.25	0.25	0.5	0.75
	85 to 89	0.25	0.25	0.25	0.5	0.75	0.75	0.25	0.25	0.25	0.5	0.5	0.75
	80 to 84	0.25	0.25	0.5	0.75	0.75	1	0.25	0.25	0.5	0.5	0.75	0.75
	75 to 79	0.25	0.5	0.75	0.75	1	1.25	0.25	0.5	0.5	0.75	0.75	1
	70 to 74	0.5	0.75	0.75	1	1.25	1.75	0.5	0.5	0.75	0.75	1	1.25
	65 to 69	0.75	0.75	1	1.25	1.75	2	0.5	0.75	0.75	1	1.25	1.5
	60 to 64	0.75	1	1.25	1.75	2	2.25	0.75	0.75	1	1.25	1.5	1.75
	55 to 59	1	1.25	1.75	2	2.25	2.75	0.75	1	1.25	1.5	1.75	2
	50 to 54	1.25	1.75	2	2.25	2.75	3	1	1.25	1.5	1.75	2	2.25
	45 to 49	1.75	2	2.25	2.75	3	3.5	1.25	1.5	1.75	2	2.25	2.5
	40 to 44	2	2.25	2.75	3	3.5	4	1.5	1.75	2	2.25	2.5	3
	35 to 39	2.25	2.75	3	3.5	4	4.5	1.75	2	2.25	2.5	3	3.25
	30 to 34	2.75	3	3.5	4	4.5	5	2	2.25	2.5	3	3.25	3.5
	25 to 29	3	3.5	4	4.5	5	5.5	2.25	2.5	3	3.25	3.5	4
20 to 24	3.5	4	4.5	5	5.5	6.25	2.5	3	3.25	3.5	4	4.5	
15 to 19	4	4.5	5	5.5	6.25	6.75	3	3.25	3.5	4	4.5	4.75	
10 to 14	4.5	5	5.5	6.25	6.75	7.5	3.25	3.5	4	4.5	4.75	5.25	
5 to 9	5	5.5	6.25	6.75	7.5	8	3.5	4	4.5	4.75	5.25	5.75	
0 to 4	5.5	6.25	6.75	7.5	8	8.75	4	4.5	4.75	5.25	5.75	6.25	
Frozen Ballast	40 to 44	1	1.25	1.5	1.5	1.75	2	0.75	1	1	1.25	1.25	1.5
	35 to 39	1.25	1.5	1.5	1.75	2	2.25	1	1	1.25	1.25	1.5	1.75
	30 to 34	1.5	1.5	1.75	2	2.25	2.5	1	1.25	1.25	1.5	1.75	1.75
	25 to 29	1.5	1.75	2	2.25	2.5	2.75	1.25	1.25	1.5	1.75	1.75	2
	20 to 24	1.75	2	2.25	2.5	2.75	3.25	1.25	1.5	1.75	1.75	2	2.25
	15 to 19	2	2.25	2.5	2.75	3.25	3.5	1.5	1.75	1.75	2	2.25	2.5
	10 to 14	2.25	2.5	2.75	3.25	3.5	3.75	1.75	1.75	2	2.25	2.5	2.75
	5 to 9	2.5	2.75	3.25	3.5	3.75	4	1.75	2	2.25	2.5	2.75	3
	0 to 4	2.75	3.25	3.5	3.75	4	4.5	2	2.25	2.5	2.75	3	3.25

Instructions:

1. This chart specifies removal amounts to field-adjust locations where the neutral temperature has been affected when CWR is cut or broken.
2. Use this table only to avoid having to return for rail adjustment at a later date. If a CWR rail removal work order exists for the location, **remove the amount of rail specified in the work order.**
3. Match up the measured rail temperature on the left-hand column with the tie type and Target RNT on the top row. The intersecting number is the pull amount, in inches, to restore rail to the desired neutral temperature and avoid an additional work order.
4. If the rail adjustment location is **within 400 feet of a fixed object** (turnout, grade crossing, open deck bridge, or diamond), then the chart does not apply - utilize rail adjustment App or rail removal work order to determine proper adjustment taking proximity to fixed object into consideration.

Representative Rail Installation Report

BNSF Rail Installation Report as of 14:18 on 11/05/2020															
Work Date	DIV	SUB DIV	Track Nbr	Beg MP	End MP	Rail Pos	String (Project) Length	Rail TNT	Stations	Actual Temp	Actual Expansion	Installed RNT	Gang	Create ID	Create Date
10/14/2020	CHS	BROOKFIELD	Main 0	17.86	18.75	L	5147	100	Start Station	65	0	99	RP03	RP0003	10/14/2020
								200		75	3/8	99	RP03	RP0003	10/14/2020
								400		66	1/2	98	RP03	RP0003	10/14/2020
								600		75	3/8	99	RP03	RP0003	10/14/2020
								800		73	1/2	105	RP03	RP0003	10/14/2020
								1000		81	1/4	97	RP03	RP0003	10/14/2020
								1200		77	3/8	101	RP03	RP0003	10/14/2020
								1400		83	1/4	99	RP03	RP0003	10/14/2020
								1600		82	1/4	98	RP03	RP0003	10/14/2020
								1800		82	1/4	98	RP03	RP0003	10/14/2020
								2000		93	1/8	101	RP03	RP0003	10/14/2020
								2200		91	1/8	99	RP03	RP0003	10/14/2020
								2400		92	1/8	100	RP03	RP0003	10/14/2020
								2600		93	1/8	101	RP03	RP0003	10/14/2020
								2800		94	1/8	102	RP03	RP0003	10/14/2020
								3000		96	1/8	104	RP03	RP0003	10/14/2020
								3200		100	0	100	RP03	RP0003	10/14/2020
								3400		101	0	101	RP03	RP0003	10/14/2020
								3600		100	0	100	RP03	RP0003	10/14/2020
								3800		100	0	100	RP03	RP0003	10/14/2020
								4000		100	0	100	RP03	RP0003	10/14/2020
								4200		100	0	100	RP03	RP0003	10/14/2020
								4400		100	0	100	RP03	RP0003	10/14/2020
								4600		100	0	100	RP03	RP0003	10/14/2020
								4800		101	0	101	RP03	RP0003	10/14/2020
								5000		100	0	100	RP03	RP0003	10/14/2020
								End Of Project		101	0	101	RP03	RP0003	10/14/2020

Representative Rail Adjustment Electronic Reporting Form

Additional Info for LS 1001 | MP 534.00000 - 535.00000

General Joint 1 of 2 for REPAIR SERVICE FAILED RAIL | MP 534.00000 - 535.00000 | MAIN TRACK / 0

<p>General Joint</p> <p>*Line Segment: 1001</p> <p>*Milepost: 534.373</p> <p>*Track Type: MAIN TRACK</p> <p>*Track Number: 0</p> <p>*Work Location: On Track</p> <p>*CWR or Bolted: CWR</p> <p>*Weldable Joint: YES</p> <p>*Hyral Only Location: NO</p>	<p>CWR Attributes</p> <p>*Rail Gap: 2.5</p> <p>*Rail Pull: 0</p> <p>*Rail Temperature: 25</p> <p>*Track Strength Index: Strong</p> <p>*The Anchoring Index: Every Other Wood The Anchored</p> <p>*Frozen Ballast: No</p> <p>*Fixed Object: No</p> <p>*Orig Match Mark Measurement: 28</p>	<p>Weldable Equipment</p> <p>*Rail Position: Right Tangent Rail</p> <p>*Rail Weight: 132</p> <p>*Head Loss: 0</p> <p>*Tie Type: WOOD</p> <p>Rail Joint Conditions:</p>
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Comments

Representative Rail Adjustment Report

CWR Adjustments As of 01/25/2021

This report shows all of the CWR locations that were active during the time range selected.
 Rollup: S0801
 Period : 01/01/2021 - 12/31/2021

Line Segement	Group Number	Zone Achor Flag	Mile Post Beginning	Mile Post Ending	Open or Resolved	Track Type	Track Numbl	Left/ Right	Originating Event Work Date	Gap	Pull	Rail Temp	FrabrK Rail Neutral Temp Est.	Final Rail Neutral Temp
7000	Z7000-M-2-S-100967	Y	139.336	139.336	Resolved	M	2	L	01/12/2021	1.00	.00	40	94.06	
			139.336	139.336	Resolved	M	2	L	01/12/2021	.00	.00	40	n/a	
			139.338	139.338	Resolved	M	2	L	01/12/2021	.00	.00	40	n/a	
	Z7000-M-2-S-100957	Y	128.155	128.155	Open	M	2	L	01/07/2021	1.00	.00	39	93.06	104
			128.150	128.150	Open	M	2	L	01/07/2021	.00	.00	39	n/a	39
	Z7000-M-2-N-100959	Y	208.320	208.320	Resolved	M	2	R	01/23/2021	2.00	2.00	36	112.45	112
	Z7000-M-2-N-100958	Y	202.333	202.333	Resolved	M	2	R	01/23/2021	2.00	2.00	36	112.45	112

Representative Walking Rail Joint Inspection Electronic Reporting Form

↑

Collect

00:00:00

WO# 1007285915

Rail Joint Inspection Main Track 0 ⓘ

LEFT TANGENT INSULATED RAIL JNT DueDate: 06/30/2021

LS: 7101 BMP: 0.01008 EMP: 0.01008 Class: 3 Last Inspected: 08-12-20

213.121

Torch Cut

0

Inspection Notes

Crossties

Joint

Rail Defects

Other

Joint Bar

213.121

0

Bolt

213.121

0

Rail End Tread Mismatch

213.115

0

Rail End Gage Mismatch

213.115

0

Rail End Batter

213.121

0

Rail Joint Lateral Movement

BNSF:121

0

Excessive Movement

213.121

0

Rail End Gap

213.121

0

Monday, January 25, 2021, 10:09 CST