PROCEDURES FOR THE INSTALLATION, ADJUSTMENT, MAINTENANCE, AND INSPECTION OF CWR AS REQUIRED BY 49 CFR 213.118

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TABLE OF AMENDMENTS:

CHAPTER & SECTION	AMENDMENT	DATE
1.9	Further clarification	
3.2	Removed cut from f) 1.	
3.3	Removed pull back marks section	
3.4 & 3.5	Moved to sections 1.8 and 1.9	
3.4	Updated Plug Rail Restriction Table	
5.3	Changed 92°F to 95°F	
Table 5.1	Changed 60°F to 80°F	
7.1	Changed 125°F to 127°F and 92°F to 95°F	
Appendices	Updated Break Charts	

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This document details Amtrak's policy on installing, adjusting, maintaining and inspecting Continuous Welded Rail (CWR). Each chapter details how Amtrak applies its standards and procedures to comply with FRA standards. The procedures outlined herein apply to CWR on all Amtrak main tracks, sidings, and other tracks. Upon the effective date, all new installations of CWR shall be performed in accordance with this policy. Legacy installations performed in accordance with previous policies shall be corrected when new rail is laid, or it becomes necessary to work the track in a manner requiring adjustment. In application of these procedures, only those individuals qualified through training outlined in Chapter 8 of this document are permitted to supervise the installation, adjustment, and maintenance of CWR track. These individuals are referred to as "CWR qualified" throughout this document.

Chapter 1 CWR Installation and Thermal Adjustment

1.1 Definition of CWR

a) Continuous welded rail, CWR, is rail that has been welded together into lengths exceeding 400 feet. Rail installed as CWR remains CWR, regardless of whether a joint or plug is installed into the rail later.

1.2 Use of CWR

a) CWR fabricated by an approved process may be installed in ballasted and direct fixation track in accordance with the procedures outlined herein.

b) CWR may be installed across open deck bridges where bridge ties are installed with spacer blocks tightly jacked and fastened together with spacing bars secured by lag screws in at least every third tie, and the deck is securely fastened to the steel structure by means of hook bolts or other approved holding devices.

1.3 Connecting CWR Strings

a) In the case of a bolted joint installed during CWR installation one of the following shall occur within 60 days:

    1. Weld the joint
    2. Install a joint with six bolts; or
    3. Anchor every tie 195 feet in both directions

b) Electric Flash Butt Welding is the preferred method of connecting CWR strings. Thermite welding may also be used.

c) Only a rail saw may be used for final rail cuts to be welded or bolted. All torch cut rails shall be cut back a minimum of six inches from the torch cut end with rail saw to eliminate the heat affected zone. Reminder, torch cut rail is prohibited for use in track except in an emergency.

d) When thermite welding a temporary joint between CWR strings that have already been adjusted, the gap for the weld must not be developed by letting the rails contract. Cut rail ends to achieve gap and use rail stretchers or heaters as necessary to ensure there is no net gain of rail.

1.4 Rail Neutral Temperature

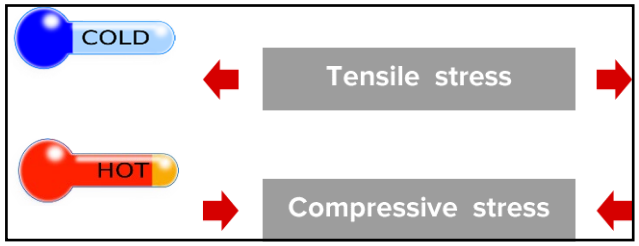


Figure 1 Tensile & Compresses Stresses

Rail Neutral Temperature (RNT) is the temperature at which rail is in its Neutral Stress state, meaning the rail is neither in tension nor compression. When the actual rail temperature is below RNT it will be in tension, and when it is above it will be in compression. Steel expands as its temperature increases and contracts as it decreases. Likewise, rail lengthens as temperature increases and shortens as it deceases. When constrained from movement in track, tensile (cold) or compressive (hot) stresses develop in the rail during temperature change. Excessive compressive stress in the rail could lead to a track buckle, while excessive tensile stress could lead to rail break or pull apart.

a) Target Rail Neutral Temperature, (TRNT), is the desired rail temperature when the rail is in neutral stress. Unless otherwise specified in the "TRNT Table for Specific Locations" found in the Appendices of this document Amtrak's Target Rail Neutral Temperature (TRNT) is as follows:

- Ballasted track outside of tunnels = 100°F
- Ballasted track more than 200' inside tunnels = 80°F
- Non-ballasted track construction, (direct fixation) over 400' in length = 80°F

b) Temperature Differential is the difference between the Target Rail Neutral Temperature (TRNT) and the Actual Rail Temperature.

c) When rail is initially laid in its bed it should be in a stress-free state (neutral stress). If fastened down at this time, the Rail Neutral Temperature is established, and equal to the Actual Rail Temperature.

d) Rail Neutral Temperatures slightly lower or higher than the TRNT are acceptable but must be adjusted in accordance with this chapter when outside of the following acceptable installation range. Rail must be adjusted when the Rail Temperature at the time of installation is:

- More than 10°F Below TRNT, OR
- More than 20°F above TRNT

1.5 Corrective and Protective Measures for CWR Installations

a) When rail temperature exceeds TRNT by more than 20°F during installation, the Assistant Division Engineer or designee shall be notified and make provisions for later adjustment when ambient temperatures permit and before the onset of cold weather.

b) When rail temperature is more than 10°F below TRNT during installation, rail must be adjusted, or a 30(P)/25(F) mph speed restriction placed prior to rail temperature more than 45°F above the rail neutral temperature.

c) When estimating what the rail temperatures will be for a given area and time, the rail temperature can be up to 30°F higher than the ambient temperature on warm sunny days.

1.6 Calculating Neutral Temperature Adjustment

RNT is changed when a length of rail is adjusted. Follow these requirements when calculating the amount of adjustment in length needed:

a) The following equation is used to calculate the change in length of CWR:

$$\mathbf{(TRNT-T_a) \times L \times 0.000078 = A}$$

TRNT	=	Target Rail Neutral Temperature
T_a	=	Actual Rail Temperature
L	=	Length of rail (feet)
A	=	Adjustment (inches)

b) A table form of this calculation for Temperature Differential (TRNT – T_a) and Length of rail (L) is shown in the Appendices. See the CWR Adjustment Table.

c) In practical applications the amount of adjustment may be rounded up provided the RNT does not exceed the thresholds established in section 1.4 (no more than 20°F above TRNT).

Example: To adjust a 1,600' length of CWR at a rail temperature of 45°F to the corresponding length of rail at TRNT=100°F, the amount of expansion is calculated as follows:

TRNT – T_a = 100-45= 55°F

A = 0.000078 x 55 x 1600= 6.86" or 6-7/8"

6.86 inches (6-7/8") of ***expansion*** should be observed along the entire length of the rail.

Note: In this example rounding up to 7" would be acceptable for practical application in field, as this is equivalent 101°F RNT.

1.7 Adjustment by Heating, Natural Temperature Change, or Mechanical Stretching

a) The CWR qualified employee in charge of adjusting CWR is responsible for completing **Report D – *Record of Rail Neutral Temperature for CWR.*** See also Chapter 9- Recordkeeping.

b) Prior to adjustment, rail must be able to move freely throughout its entire length. In the case of conventional cut spike plates, rail may be expanded in the tie plates before or after spiking but anchors must not be applied until adjustment is complete.

c) Rail previously anchored must be brought to neutral stress by removing anchors and clips before adjustment and ensuring the rail can move freely at the end and throughout its entire length. Tap tie plates with hammers or vibrate rail to promote movement and help ensure rail is in neutral stress.

d) Be aware of any welds within the string and ensure they will not become hung up on adjacent ties during the adjustment (see picture at right).

Figure 2 Field Weld Adjacent Tie

e) Once rail is in neutral stress, the Amtrak approved magnetic rail thermometer, SAP# 3630005088, shall be used to measure rail temperature for adjustment calculations immediately before the adjustment begins. Industrial type Infrared Thermometers that are

specifically designed for measuring rail temperature or temperatures of metals may be used when approved by the Deputy Chief Engineer of Track or designee.

Figure 3 Amtrak Approved Rail Thermometers

f) At least two rail thermometers shall be used to ensure accuracy. There should be a close correlation between the two temperature readings, and the lower reading shall be used to determine temperature differential. If there is doubt in the accuracy of either reading, additional thermometers shall be used to determine which thermometer may be defective.

Figure 4 Placement of Rail Thermometer

g) The rail thermometers shall be placed on the center of the web of the rail, shielded from direct rays of sun, and left there for approximately five minutes to determine the temperature accurately. When using infrared thermometers, take the temperature in the same place- shaded side, center of the web of rail.

h) Provide space for expansion at the end of rail being adjusted. At closure welds, compensate for thermite gap or rail consumption if butt welding so that final adjustment is not affected. During the adjustment process, monitor the end of the next string for movement by using match mark across rail base and tie plate or bolster and compensate for any movement so that final adjustment is not affected.

Figure 5 Example of Required Expansion Gap

i) A <u>Match Mark</u> is a continuous line drawn on the base of rail to the tie plate or top of bolster if concrete (see Figure 6 below). Note: ties and tie plates used must not move during the adjustment process. Ensure uniformity of expansion throughout the length of rail being adjusted by using the following <u>Match Mark Procedure</u>:

1. Before beginning the adjustment operation, establish match marks at intervals not exceeding 400’ from the start of adjustment. Typically, the interval used is determined by dividing the length into four equal parts (quarters) and establishing match marks at those quarter points. When the length of rail being adjusted exceeds 1,600’ more than four intervals will be required.

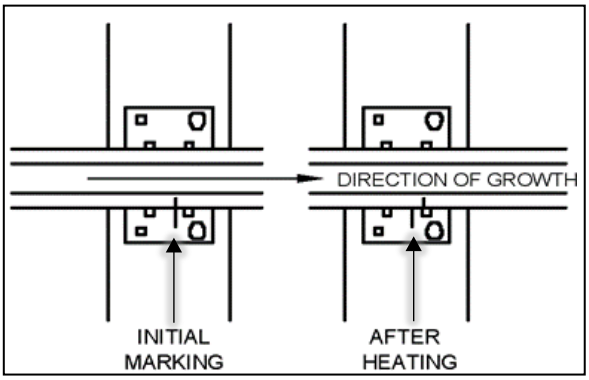


Figure 6 Reference Marks Before and After Heating

2. Determine the amount of adjustment required at each match mark using its distance from the start for length and the formula in section 1.6 or the CWR Adjustment Table in the Appendices. Quarter point match marks are convenient to use as the total adjustment can be multiplied by 1/4 (0.25), 1/2 (0.5), and 3/4 (0.75) to determine the amount required at each respective point. As previously noted, in practical application the adjustment at each match mark may be rounded up for ease of measurement provided the RNT in any interval and the overall length does not exceed the thresholds established in section 1.4 (no more than 20°F above TRNT).

Example Using Match Marks:

To adjust a 1,600' length of CWR at a rail temperature of 45°F to the corresponding length of railat TRNT=100°F mark the rail at 400', 800', and 1,200' from the start of rail expansion:

TRNT – T_a = 100-45= 55°F

At 400': A = 0.000078 x 55 x 400= 1.71" or 1-3/4"

At 800': A = 0.000078 x 55 x 800= 3.43" or 3-1/2"

At 1200': A = 0.000078 x 55 x 1200= 5.14" or 5-1/4"

At 1600': A = 0.000078 x 55 x 1600= 6.86" or 7"

Or- From the CWR Adjustment Table for Temperature Differential = 55°F(rounding up to the nearest 1/4"):

A = 1-3/4" at 400', 3-1/2" at 800', 5-1/4" at 1,200', and 7" at the end 1,600'

Or- Since these are quarter points, multiplying the total adjustment of 7"

by:At 400': 0.25 X 7" = 1-3/4"

At 800': 0.50 X 7" = 3-1/2"

At 1200': 0.75 X 7" = 5-1/4"

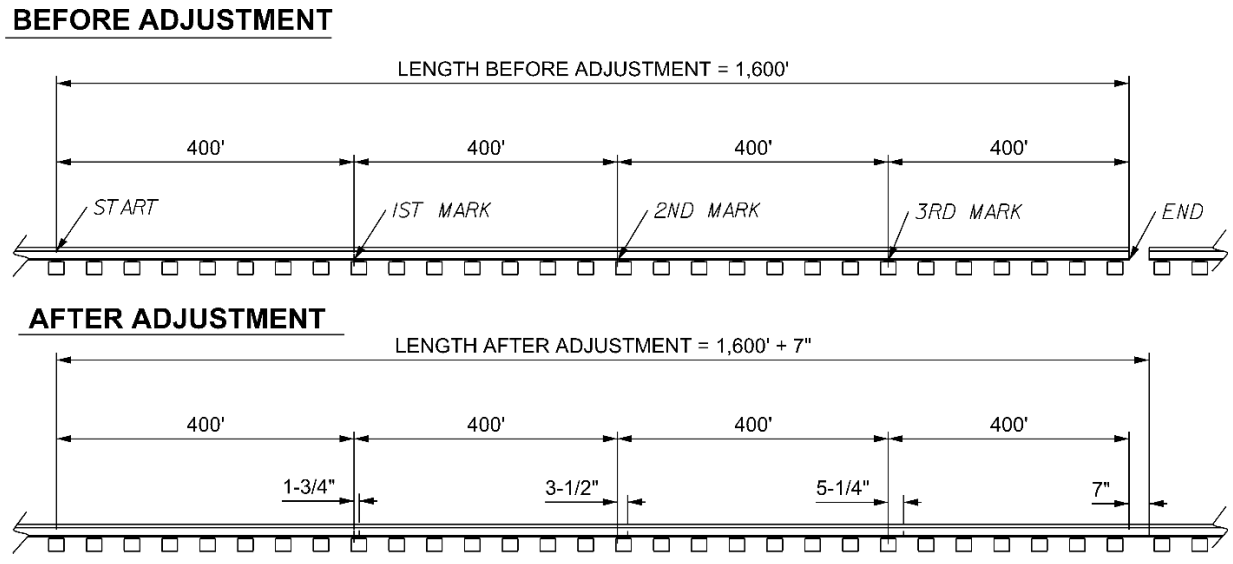


Figure 7 Rail Expansion due to Adjustment

j) A rail heater is a piece of equipment used to adjust the length of rail by applying heat. Rail temperature should not be measured behind a rail heater to judge the progress of adjustment, instead the matchmarks and end of rail must be observed for the required movement while heating. CWR should be heated so that expansion is introduced uniformly from the beginning of the string to the end. Heat must be steadily applied while moving, using multiple passes if needed to achieve the required expansion at each match mark and at the end of string. Use rail vibrators and tap tie plates with hammers to promote movement during the heating operation.

Figure 8 Rail Heater

k) The clipping or anchoring operation must progress closely enough behind the rail heater to ensure the rail is held in place and the required expansion is not lost, but not so close that it restrains movement in areas still being worked by the heater. If the clipping or anchoring operation is not able to keep up with the rail heater, anchor the first 10 ties beyond the match mark as the heater passes to ensure the expansion is held in place.

l) When using rail heaters on concrete tie track, monitor heat to avoid damaging pads or insulators.

m) A combination of mechanical expansion and rail heater may be used provided uniform movement is achieved throughout the length being adjusted.

n) In no case should the desired expansion exceed the tonnage or travel limits of the rail stretcher. When the temperature differential requires expansion in excess of the rail stretcher capacity, rail must be adjusted by applying heat or the mechanical adjustment performed during warmer temperatures.

Figure 9 Closure Welding with Rail Puller

o) When performing mechanical expansion in curves, care must be taken not to apply excessive amounts of force that could chord the curve or pull the rail out of its seat. As force is being applied by the puller, the length of rail being adjusted through the curve must be closely observed for indications such as these, and the operation must be stopped immediately when they are found.

p) When performing mechanical expansion in curves with elastic fasteners, apply a minimal number of clips to keep the rail seated. In concrete tie track the insulators may be removed during adjustment to allow rail movement, but once adjustment is complete all insulators must be reinstalled for proper anchorage. In other situations, Zero-Longitudinal Restraint clips (ZLR) or sprung clips may be required in higher degree curves to allow the rail to move freely.

1.8 Cut and Throw of Track

When CWR track is cut and thrown, the area over which the track is thrown (shifted) must be de-stressed and thermally adjusted to the TRNT a minimum of 390' in each direction from the ends of the area.

1.9 Panel Track and Turnout Installation in CWR Territory

When panel track and turnout installations in CWR territory are performed, these areas must be destressed and thermally adjusted to TRNT in accordance with procedures outlined in paragraphs a) and b) below.

a) Panel Track Installation: All rail installed as part of the work shall be adjusted to TRNT including the parent rails over a minimum distance of 390 feet from connection to the new panel(s). When crossing panels have been paved prior to adjustment, the panel rail and parent rail outside of the crossing surface shall be adjusted as described above.

b) Turnout Installation: The parent rails shall be adjusted to TRNT over a minimum distance of 390 feet from connection to the turnout. Any track panels or buffer rails between the turnout panels and the parent rails installed as part of the work shall also be included as part of the adjustment. Use the following procedure and Figure 10 when installing and adjusting newly installed turnouts:

1. Prior to cutting the rail, take the rail temperature, determine cut locations. Cut and remove existing switch panel and install new.
2. If coming back at a later date to weld, complete Report A and write the date, gang number, and established rail neutral temperature on the parent rails. The established rail neutral temperature will be the actual rail temperature when the panel is connected to the parent rails. Follow the guidelines in Section 1.5 if not completing adjustment at this time.
3. When returning to adjust the install, establish match marks as described in Section 1.7 on each rail approximately every 50 ft for a distance of 390 ft beyond the point end and frog end of the turnout.
4. Make all welds within the switch area before de-stressing the turnout and parent rails.
5. Knock off the anchors or clips on all rails behind the long ties for 390 ft at the frog end of the installed turnout. Measure the rail temperature. Calculate the amount of rail to be removed as described in Section 1.6.
6. Cut out the amount of rail required for expansion, make the weld, and reapply the clips or anchors.
7. Next, move to the switch point end of the turnout and repeat steps 5 and 6 above.
8. If installing a turnout, not in a crossover, that creates a new adjacent track, repeat steps 5 and 6 for the adjacent track.

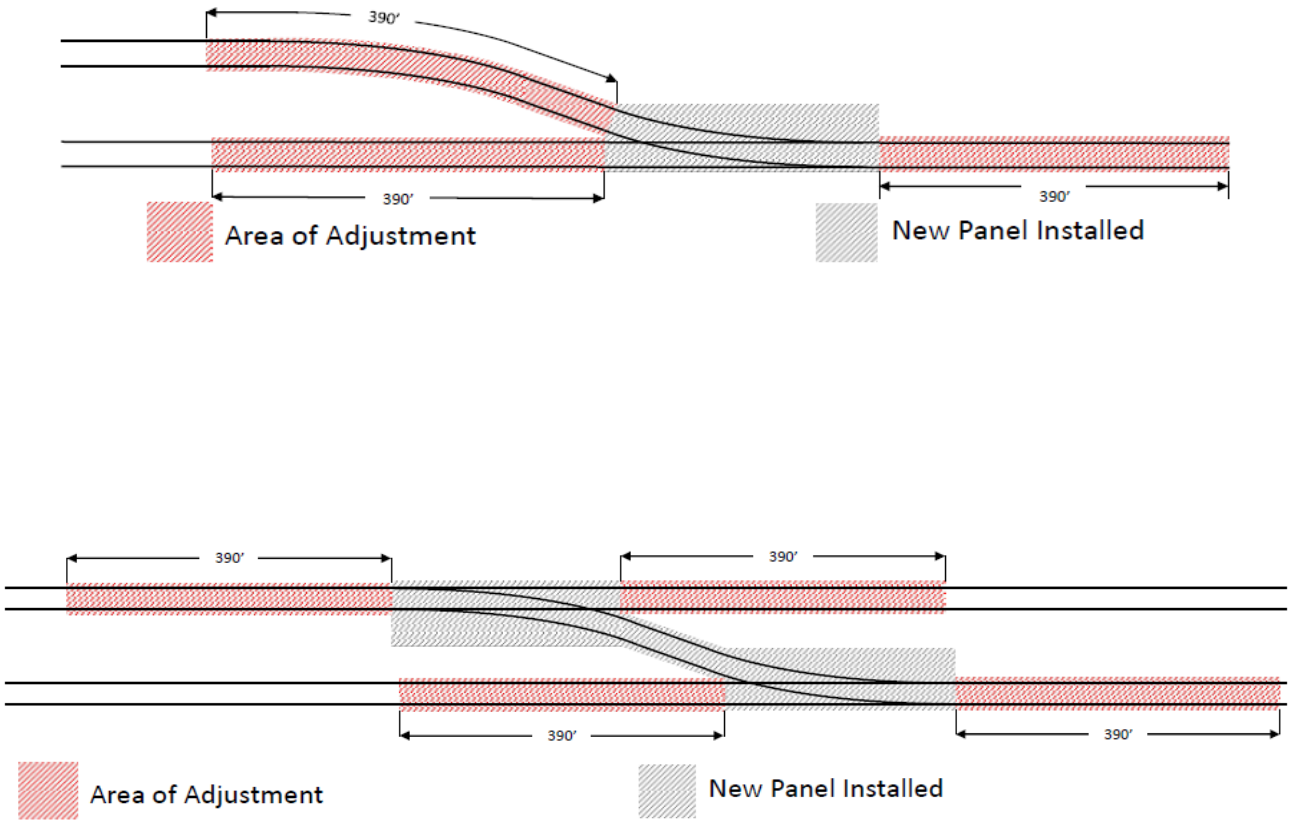


Figure 10 Turnout & Crossover Installation

Chapter 2 Rail Anchoring Requirements

2.1 Anchoring- General

Rail Anchors are devices applied to CWR to prevent the rail from moving longitudinally (parallel to the rail) as a result of temperature change or forces from train traffic.

a) When properly installed, a box anchored tie shall have anchors applied to both rails on each side of the tie and bearing snuggly against the face of the tie to prevent longitudinal rail movement.

b) Elastic fasteners (e-clip, PR clip, fast clip) replace the need for rail anchors. A fully clipped wood or concrete tie is equivalent to a box anchored tie with conventional plates and cut spikes. A concrete tie is considered fully clipped when it has all insulators, pads, and clips installed.

c) Rail Anchor and Elastic Fastener Pictures and Diagrams:

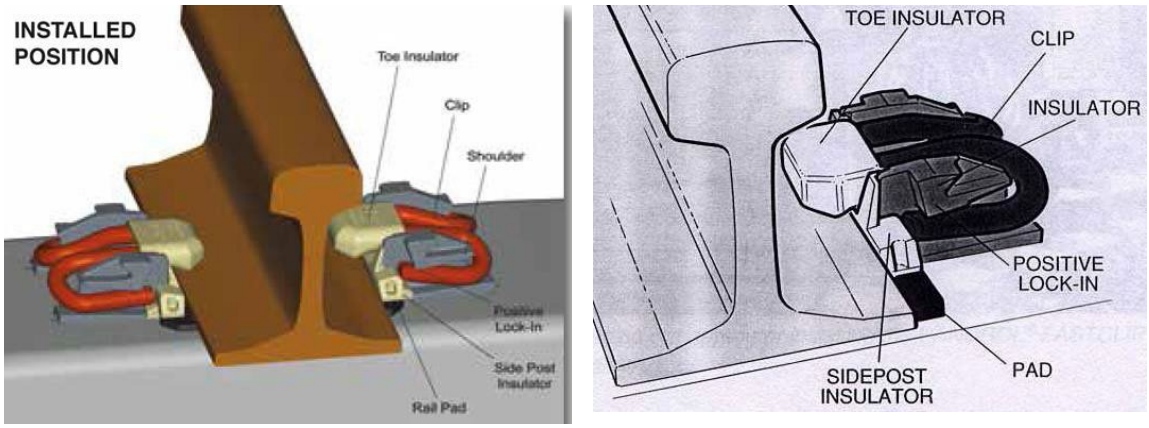


Figure 11 Elastic Fasteners: Fastclip on Concrete Tie

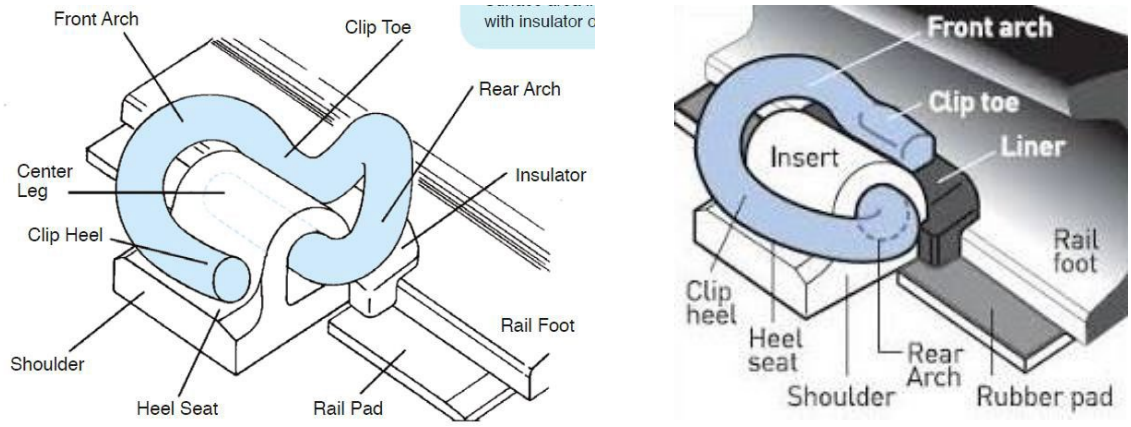


Figure 12 Elastic Fasteners: PR Clip (Left) & e-Clip (Right) on Concrete Tie

Figure 13 e-Clip on Concrete (Left) & Conventional Box Anchored Wood Tie (Right)

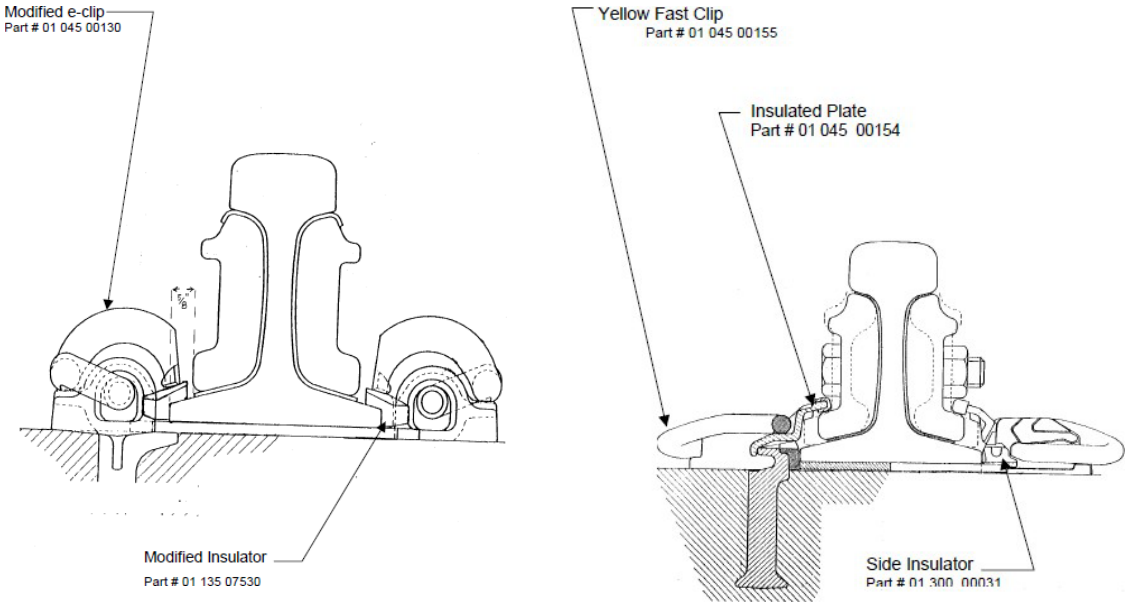


Figure 14 Concrete Tie Elastic Fasteners at Insulated Joints

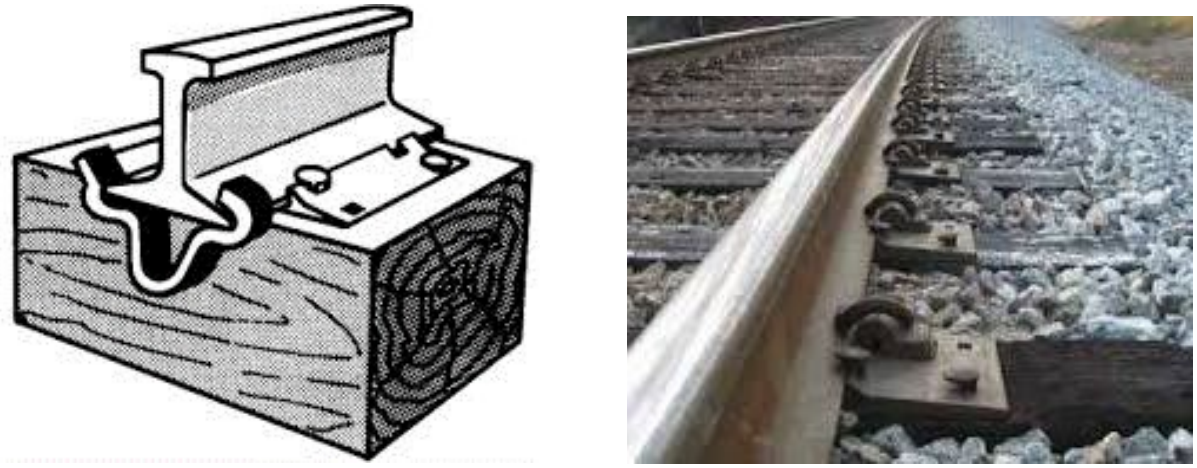


Figure 15 Woodings Rail Anchor (Left) & Wood Tie with e-Clip (Victor Plate)

Figure 16 Various Types of Drive-on Rail Anchors

2.2 Anchoring- Patterns

a) Anchors should only be applied where they will not interfere with the signaling system or other track appliances; they should not be applied where they are inaccessible for adjustment or inspection.

b) Do not apply anchors within one inch of a weld or end of joint bar. Use only the approved specially designed devices at joint bar locations in the case of elastic fasteners.

c) When rail anchors cannot be applied at joint bars or welds, anchors on both rails must be omitted to prevent skewing of ties.

d) Box anchor every other tie in CWR except as follows:

   1) Fully box anchor (every tie) 200' in each direction from:

      - Permanent Joints other than glued insulated joints.
      - Temporary joints in CWR that are not intended to be welded within 60 days.
      - Turnouts, crossovers, diamonds, and other special trackwork.
      - Open deck bridges, road crossings, direct fixation, or ties embedded in concrete.

   2) To the extent practical, box anchor every tie within turnout and crossover areas.

e) Additional anchors may be applied in situations where there is evidence that rails are moving progressively under traffic or there is need to provide additional restraint against movement.

2.3 Anchoring- Maintenance

a) Properly installed rail anchors will have full bearing against the tie when applied to the base of rail. Periodic adjustment may be required to maintain bearing against the tie.

b) To avoid damage, only proper hand tools or machines should be used in applying and removing rail anchors or clips.

c) Unless using mechanized equipment, rail anchors should not be adjusted more than one inch. If larger adjustments are required, remove and reapply anchors in proper position.

d) When renewing or re-spacing ties, the anchors must be repositioned or removed and then reapplied in proper position. During the work replace any broken or defective anchors and apply additional anchors, if necessary, to meet anchor pattern requirements.

e) Areas with insufficient anchoring shall be protected by a 30(P)/25(F) speed restriction until corrected.

Chapter 3 Maintaining Rail Neutral Temperature

When CWR is cut or broken for any reason the RNT is directly impacted. When CWR is cut or broken at rail temperatures below its RNT a gap will be produced as the tensile forces in the rail are released. Adding rail to fill this gap will lower the RNT. If the RNT is lowered during these operations, it increases risk of track buckling when ambient temperatures increase. The following procedures shall be used to ensure RNT is maintained within a "safe range" when performing rail maintenance or repairs in CWR track.

3.1 RNT Safe Range

Amtrak's "safe range" is TRNT +/- 20° (80°F to 120°F for TRNT= 100°F). This range is not to be used for new CWR installations as described in Chapter 1, follow procedures described in Chapter 1 regarding adjustment to TRNT for new CWR installations.

3.2 Plug Rails

a) A plug rail is a piece of rail cut into CWR; typically, this is done to remove a rail defect or broken rail. For the purposes of this section a plug rail is less than or equal to 100' in length. Any rail lengths longer than 100' must be installed and adjusted in accordance with Chapter 1.

b) The minimum plug rail length shall be 18' and the cut locations shall not create rail lengths in track less than 18' (14' to an existing field weld or glued IJ is acceptable). When this requirement cannot be met, provisions for later removal and adjustment must be made. This requirement does not apply in all situations such as in special trackwork where the distance between opposing switch points or from the end of a frog arm to the IJ in a crossover necessitates shorter rail lengths or as otherwise directed by Deputy Chief Engineer of Track or designee.

c) When CWR is cut or broken at a rail temperature below its RNT, a gap will be produced. If no gap is observed after the cut, the RNT is equal to the rail temperature at the time and when rail temperature is above RNT the rail will run in during the cutting process.

   SAFETY REMINDER: CAUTION MUST BE USED WHEN CUTTING RAIL THAT IS IN COMPRESSION. When it is evident that rail is in compression (running in), relieve compression in the rail using a torch and the "H" cut method, burning out the head followed by the base and then the web. Trim back or bypass rail ends as anchors are removed to ensure rail is free to expand when in compression until all stress is released.

d) Proper measurement of rail movement in CWR is critical to accurately monitor changes in RNT. The following procedures explain how to correctly apply pre-cut/break reference marks and measure the distance for a rail cut versus a rail break. The objective is to reference the rail length **before** the separation occurred and track changes in rail added or removed using the distance between the reference marks.

e) Plug Rail Reference Marks: All plug rail installations must be performed and documented in accordance with the following procedure. All markings on the rail are to be made with a paint marker or other permanent marking device. Do not use Lumber crayon, keel, soap stone, or other non-permanent marking devices.

   1. Prior to making any cuts in the rail, measure and note the rail temperature, determine cut locations, and place reference marks as shown below. Reference marks shall be made a minimum of 3 feet outside the cut marks to avoid overlap with joint bars and spaced using a distance measured to whole foot. Reference marks shall be a vertical line drawn on the head of rail and down through the web.

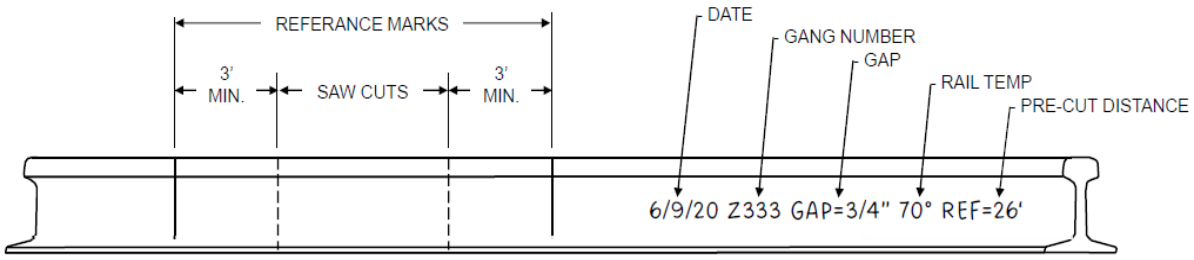


Figure 17 Reference Mark and Info at a Plug Rail

2. In the cases of broken rails, account for the gap produced to establish the distance between marks before the break occurred.

   Note: In the case of rail head breakout, measure at the base or other point where the railends remain fully intact to get an accurate measurement.

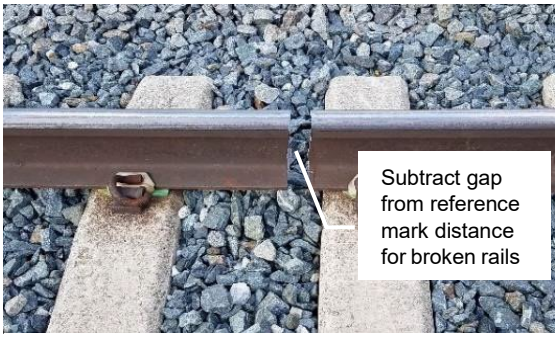


Figure 18 Gap Produced from Broken Rail

3. Determine rail gap:
   - For unbroken rails: Make first saw cut and measure the gap produced. If the rail ends run in during the cutting process, the amount of run in shall be measured by the difference in distance between reference marks before and after the work occurs and the Gap distance shall be noted as a negative number.
   - For broken rails: Measure the gap that was produced from the rail break.
4. ***Complete Report 'A' (as found in the Appendices, see also Chapter 9- Recordkeeping)*** including all required information for plug rails and the new established RNT. If no further adjustment is made the new RNT is equal to the lowest rail temperature at the time work occurred.
5. Write the following information on the adjacent parent rail:
   - Date
   - Gang number
   - Gap at first cut or break
   - Rail temperature
   - Pre-break/cut distance between Reference Marks.

f) Determining Pre-break/cut RNT using Break Charts: Break Charts can be used as a method of determining RNT before rail was cut or broken. The following outlines the limitations of Break Charts and how to use them.

1. Break Charts are not applicable when:
   - both rails are broken; *or*
   - more than one cut or break exists within 800' on the same rail; *or*
   - the cut or break is within 400' of a turnout or a fixed structure such as a road crossing, open-deck bridge, diamond, or as otherwise directed by the Deputy Chief Engineer of Track; *or*
   - the ballast is frozen; *or*
   - the rail is in compression. (This will be evident if the rail is running in during a cut and binding on the saw blade).

2. Break Charts calculate Pre-break/cut RNT based on track strength, tie type, anchor pattern, and rail size. There are many combinations of these variables, but for the purposes of RNT management on the Amtrak system there are four Break Charts to select from in the appendices. These are:
   - Break Chart 1 – 5.5" rail base Every Other Tie Anchored (EOTA).
   - Break Chart 2 – 5.5" rail base Every Tie Anchored (ETA). This includes elastic fasteners and concrete ties.
   - Break Chart 3 – 6.0" rail base (and larger) Every Other Tie Anchored (EOTA).
   - Break Chart 4 – 6.0" rail base (and larger) Every Tie Anchored (ETA). This includes elastic fasteners and concrete ties.
3. To determine Pre-break/cut RNT, select the appropriate Break Chart based on rail size and anchor pattern as noted above. Enter the Break Chart with the actual rail temperature at the time the rail was cut or broken and the gap size at the first cut or break to determine the Pre-break/cut RNT.

g) Maintaining RNT within the "safe range". The following outlines accepted procedures at plug rail locations to maintain RNT within the "safe-range".

1. Often it is not possible to install a plug rail and readjust RNT at the same time. When adjustment is not performed after rail is cut or broken, the new established RNT at the location is equal to the lowest rail temperature at the time work occurred.
2. When a welding gang returns to a plug rail location, they can use the Break Charts and the information provided with the Reference Marks on the rail to readjust the location and ensure RNT is returned to the "safe range".
3. In situations where Break Charts are not applicable or with pre-break/cut RNT below the "safe range", full destressing and adjustment as described in section 3.3 is required for final repair.
4. Pre-break/cut RNT can be restored by adjusting the reference marks back to their original distance. Restoring TRNT is always preferred but restoring pre-break/cut RNT is acceptable for final repair provided it is within the safe range. Pulling or heating the rail to restore reference marks back to the exact pre-break/cut distance may be difficult due to variables encountered in the field. When the RNT indicated by the break charts is below TRNT (but within safe range), always aim to overshoot the target amount required such that reference marks are equal to or slightly less than the distance before separation occurred. Make sure to consider the space needed for thermite welding or additional consumption of rail if butt welding when trimming the rail for adjustment.

Figure 19 Re-adjusting Plug Rail Location

5. The sudden release of force when rail is cut or broken in tension, affects the RNT over a distance from the separation in each direction. This distance varies and depends on the strength of track and temperature differential at the time of cut/break. The distance over which RNT is affected is called the influence zone. The table below can be used to determine influence zone lengths for the same types of track used in the Break Charts. When adjusting RNT back to the safe-range without using the full De-stress method described in the following section, remove rail anchors in each direction from the break or initial cut through the influence zone to ensure uniform adjustment. Use the table below to determine influence zone length.

Delta T= Pre-Break RNT - RT (RT is at time of initial Break/Cut)	****Influence Zone Length Each Direction (Feet)***			
	5.5" Rail Base		***6" Rail Base***	
	Every Other Tie Anchored	***Every Tie Anchored***	***Every Other Tie Anchored***	***Every Tie Anchored***
5	37	27	44	31
10	75	53	88	63
15	112	80	132	94
20	150	107	176	125
25	187	133	219	157
30	224	160	263	188
35	262	187	307	219
40	299	214	351	251
45	336	240	395	282
50	374	267	439	313
55	411	294	483	345
60	449	320	527	376
65	486	347	570	407
70	523	374	614	439
75	561	400	658	470
****For Influence Zones Over 390'; Perform Full De-stress***				

6. Reapply or reposition all clips or anchors affected by the work in accordance with Chapter 2. Ensure clips are properly applied and anchors are snug to the face of tie when complete.
7. After work is complete, whether interim or final repair, remeasure and record the distance between reference marks on Report 'A'. This distance is equal to the Pre-break/cut distance plus the sum of rail added and removed. After final adjustment is complete the distance should measure an amount necessary to adjust the location back to the safe range.
8. Complete Report 'A' including all required information for plug rails and the new established RNT.

3.3 De-Stressing Rail

Destressing rail is the act of relieving compressive or tensile stress in the rail. Rail must be cut and de-anchored to allow the rail to move freely. The neutral stress state of rail is achieved when its unrestrained length has stopped moving.

When de-stressing rail, the following procedures shall be followed:

1. Identify the length of rail to be destressed. De-stress the area of concern and a minimum of 390' in both directions from the ends of this area. In the case of fixed structures such as road crossings, open-deck bridges, or diamonds within this 390' length, de-stress up to the near end of the fixed structure. See diagrams below:

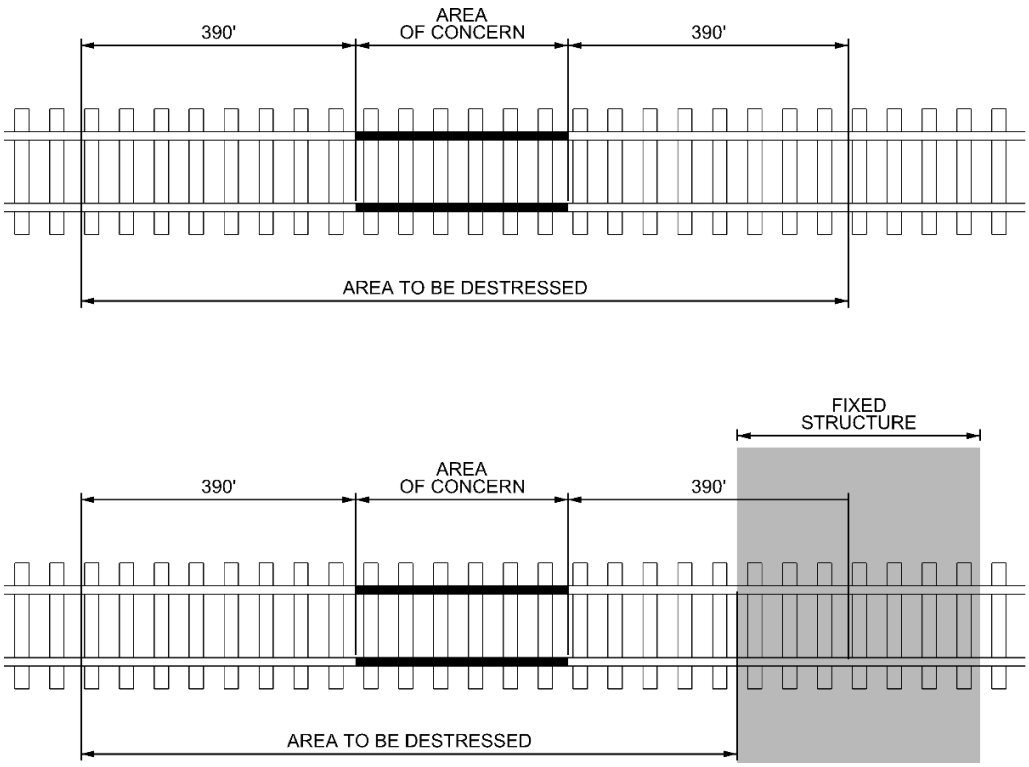


Figure 20 Destressing Rail without a Fixed Structure (Top) and with a Fixed Structure (Bottom)

2. Same as the procedures for Plug Rails in section 3.2, Reference Marks shall be used to measure the amount of rail added or removed during de-stressing and adjustment operations. The reference marks shall be placed on both sides of the cuts a minimum of three feet from the ends of the cut to avoid overlap with joint bars. Follow the same procedure for plug rails, treating the closure weld as the plug. Record information in the web of the rail and as required on Report A (see section 3.2 for Reference Mark procedures).
3. Cut the rail and remove anchors or clips throughout the length to be destressed and ensure that the entire length of rail is free to move. In the case of buckled track, make cuts outside of the misalignment and trim back or bypass rail ends to allow rail expansion while putting the track in its proper alignment. Destress the area including a minimum of 390' in each direction from the ends of the misalignment.

   SAFETY REMINDER: CAUTION MUST BE USED WHEN DESTRESSING RAIL THAT IS IN COMPRESSION. When it is evident that rail is in compression (running in), relieve compression in the rail using a torch and the "H" cut method, burning out the head followed by the base and then the web. Trim back or bypass rail ends as anchors are removed to ensure rail is free to expand when in compression until all stress is released.

4. After all anchors or clips are removed, tap tie plates with hammers or vibrate rail to promote movement and ensure rail is in neutral stress.
5. Once rail movement has settled and it is at neutral stress, take the rail temperature (far enough away from the cut so that the reading is not affected by the cutting procedure).
6. If the rail temperature is within the acceptable installation range (TRNT -10ºF/+20ºF) no further adjustment is required. Provisions shall be made to readjust locations destressed at rail temperature more than 20°F above TRNT when ambient temperatures permit and before the onset of cold weather.
7. If the rail temperature is more than 10ºF below TRNT, follow the procedures described in Chapter 1 to adjust the rail to TRNT using the de-anchored length of rail in the calculations. Follow protective and corrective measures outlined in Section 1.5 for areas de-stressed below TRNT without adjustment.
8. Reapply anchors or clips and weld in rail ends or apply temporary joint bars for welding later once destressing/adjustment is complete.
9. Remeasure distance between reference marks to determine amount of rail added or removed.
10. In addition to Date, Gang Number, Gap, Rail Temperature, and Reference Mark Distance, also write the following in the web of the rail:
    - The length adjusted in feet: Adj. Len. = XXX'
    - Adjustment in inches in parenthesis (+/-X")
    - New established RNT RNT= XXXº
11. When de-stressing through a plug rail location, also write the additional information noted above at the plug rail location so that inspectors and other workers will know the location has been adjusted.
12. Complete both **Report D – *Record of Rail Neutral Temperature for CWR*,** and **Report A – *Record of Track Disturbance*** see also Chapter 9- Recordkeeping.

3.4 Corrective and Protective Measures for Work Affecting RNT

a) Areas with RNT that is affected by work at rail temperatures below the safe range shall be prioritized for readjustment starting with the lowest rail temperatures at the time the work was performed.

b) If a plug rail is installed below the safe range and has not been readjusted prior to the rail temperature exceeding the values as shown in the table below, a speed restriction of 30(P)/25(F) mph must be placed on that section of track. **This table only applies to a plug on a single rail, if both rails are cut (example installing a set of IJ's) paragraph (c) below shall apply.**

Plug Rail Installation Temperature (°F)	Readjust or Place Slow Order Before Rail Temperature Reaches (°F)
Above 60	135
50 to 59	130
40 to 49	125
30 to 39	120
20 to 29	115
10 to 19	110
0 to 9	105
-10 to -1	100
-20 to -11	95
-30 to -21	90
-40 to -31	85

c) For all other work affecting RNT below the safe range, readjust or apply speed restriction of 30(P)/25(F) mph before rail temperatures increase by 45°F.

d) In predicting what the rail temperatures will be for a given area and time, the rail temperature can be up to 30°F higher than the ambient temperature on warm sunny days.

3.5 Bolted Joints in CWR

a) A bolted joint in CWR experiencing a service failure (broken bolts or bars) with gap present that cannot be closed by drift pin one of the following must be done:

- Eliminate joint by welding; or
- Replace the broken bar(s), replace the broken bolts, adjust the anchors and, within 30 days, weld the joint; or
- Replace broken bar(s), replace the broken bolts, install one additional bolt per rail end and adjust anchors; or
- Replace broken bar(s), replace the broken bolts, anchor every tie 195 feet in both directions from the CWR joint; or
- Replace broken bar(s), replace the broken bolts, add rail with provisions for later adjustment pursuant to section 3.4 of this Chapter, and reapply anchors.

Chapter 4 Monitoring Curve Movement Following Surfacing and Lining

Curve movement directly effects the rail neutral temperature. When curves move inward (downhill) the neutral temperature decreases, and when they move outward (uphill) the neutral temperature increases, see figure below. Monitoring curve movement following surfacing and lining operations is critical to maintaining a safe rail neutral temperature.

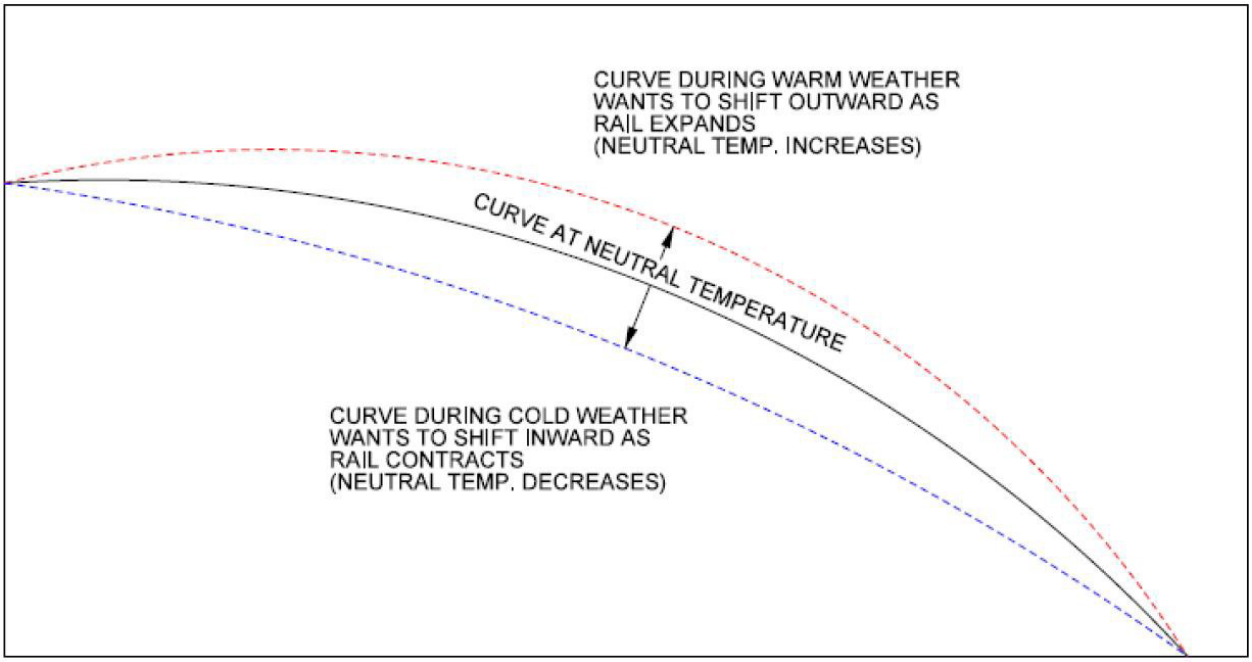


Figure 21 Effect on RNT Due to Curve Movement

4.1 Referencing of Curves

a) When using automated surfacing and lining equipment, the anticipated track throws through curved track must be analyzed to determine if the neutral temperature will be adversely affected by the solved alignment as described in 4.3 (c).

b) Prior to the start of surfacing and lining in curves greater than one degree, the supervisor or CWR qualified employee designated in charge of the operation will set a minimum of three reference points in the full body of each curve involved.

c) The reference points must be set on fixtures that will not be disturbed during surfacing operations. A reference point on the adjacent track (if the track will not be disturbed), a cat pole foundation, wood stakes, or any other object that will not be disturbed during the work may be used. The reference points are to be used to ensure the amount and direction of the design throw matches physical measurements.

d) In longer curves additional points will be required, and in no case may the points be more than 400' apart.

e) Measurements shall be made to the gage of the line rail (Note: the line rail in curves is always the outer or “high” rail, and the grade rail is always the inner or “low” rail).

f) The actual measurements shall also be compared to the anticipated throws to ensure accuracy of automated surfacing and lining equipment.

g) When placing reference points special attention should be given to areas of greatest track movement/disturbance.

h) Measurements shall be taken perpendicular to the gage line and level to the top of rail. The point on the fixed object shall be marked and the distance measured (both before and after surfacing) written on the fixed object using permanent marking device.

4.2 Inspecting for Curve Movement

a) The CWR qualified employee in charge of the surfacing operation will record the offset distance measured to each reference point on *Report 'B'- Report of Curve Movement Due to Surfacing and Lining of Curves* as found in the Appendices (see also Chapter 9- Recordkeeping). These measurements shall be taken at the following times:
- Before Surfacing
- Immediately after surfacing before first train
- After the passage of the first train

4.3 Curve Realignment (Out-of-Face)

a) The normal balancing of throws performed during lining and surfacing is not considered out-of-face curve realignment. In order to be considered out-of-face realignment, the average of the throws through the curve must be in one direction.

b) Pre- and post-work offset measurements recorded on Report 'B' shall be examined to determine when a curve has been worked out-of-face as described in the following paragraph. Plots for track throws from automated surfacing and lining equipment may also be used to assist in determining the amount and direction of throw.

Figure 22 Track Misalignment in a Curve with Road Crossing

c) When curves are shifted inward- "downhill", the RNT is lowered. When the average of the throws is equal or greater than 1-1/2" downhill, or the throw at any single point is 3" or more downhill the curve must be protected by a 30(P)/25(F) mph speed restriction until RNT is readjusted by either of the following actions:

- Both rails through the entire curve must be destressed and adjusted to TRNT or;
- The curve is realigned outward- "uphill" by the same amount

d) If the same curve is worked in multiple passes the sum of the throws at each point must be considered for the corrective and protective measures described above in paragraph (b).

Chapter 5 Protecting Areas Due to Track Disturbance

5.1 General Requirements

When performing track work in CWR territory, it is important to recognize activities that can affect the lateral stability of the track. Such activities will create “disturbed” track. The resistance to track buckling is weakened after these types of activities and remains weakened until the track has sufficiently stabilized under traffic. Track maintenance in CWR territory that disturbs the track structure must be inspected, monitored, and protected in accordance with this Chapter.

5.2 Responsibility for Protecting Work Areas

It is the responsibility of the CWR qualified employee in charge of activities that disturb the track structure to ensure all inspection, monitoring, and protective measures are executed for the entire work area. Areas where normal Maximum Authorized Speed, MAS, does not exceed the specified speed restriction do not require further protection, but they still must be inspected and monitored as outlined in this chapter.

Figure 23 Track Misalignment After Out-of-Face Tie Renewal

a) After any track work and before returning track to service a CWR qualified employee must ensure that:

- Gage, surface, and alignment have been established for the class of track
- Sufficient crib and shoulder ballast are in place
- Rail is anchored in accordance with requirements of Chapter 2.

b) Prior to removing a speed restriction, the supervisor of the operation must ensure that:

- The track has been re-inspected and no deficiencies exist
- The required numbers of trains over the area of disturbance have been met

5.3 Speed Restrictions and Other Protective Measures Required

a) Unless required by emergency, working under a continuous outage, or with permission by the Deputy Chief Engineer of Track or designee, work that disturbs the track structure is prohibited when ambient temperatures are forecasted to exceed 95°F in the 24 hours following the work being performed by the National Weather Service (www.weather.gov) for the zip code that the work is to occur. This does not include installing CWR at or above TRNT.

b) Spot Maintenance Work- The following activities as defined below are considered spot maintenance and do not require application of speed restrictions listed in Table 5.1 for out-of-face work:

- Spot tie renewal must not replace more than (4) ties in any 39’ of track nor more than (2) ties in a row and there must be at least (4) effective ties left undisturbed on both sides of those ties replaced.

- Spot surfacing is defined as restoring surface, cross level, and/or alignment through short stretches of track not exceeding 10 consecutive ties within any 39 feet of track where continuous raise is not necessary.

Note: If the same area is worked in multiple passes exceeding the requirements abovebefore the required number of trains for out-of-face work have traversed, the work shallbe considered out-of-face and the speed restrictions and durations listed table 5.1 must be applied.

c) When marking ties for out-of-face tie renewal, no more than three (3) ties in a row or more than eight (8) in 39' shall be replaced in a single pass. Tie renewal in amounts greater than this shall be made in multiple passes with ballasting and surfacing, and the minimum number of trains traversing (Table 5.1) the area between each pass.

d) After any work listed in Table 5.1, the first train will operate at maximum 30(P)/25(F) mph. After the first train traverses the work area, a CWR qualified employeemust inspect the area to ensure no deficiencies exist (misalignments, ballast section, anchoring, etc.) that would not allow for the safe passage of trains**. Following this first train requirement, trackwork in CWR shall be protected as follows**:

Table 5.1- Protective Slow Orders for Track Disturbance in CWR following Tamping Operations required by this work

Activity	Ambient Temperature over next 24 hours:		Minimum Traffic
	At or Below 80°F	Above 80°F	
	Maximum Speed (MPH)	Maximum Speed (MPH)	
Any of the following performed without Dynamic Track Stabilizer: Undercutting Out of face tie renewal Out of face surfacing Laying track/switch panels New Track Construction TLM Cut & Throw	60- Passenger 40- Freight	30- Passenger 25- Freight	24 Trains
Any of the following performed with Dynamic Track Stabilizer: Undercutting Out of face tie renewal Laying track/switch panels New Track Construction TLM Cut & Throw	80- Passenger 50- Freight*	60- Passenger 40- Freight	8 Trains
Out of face surfacing performed with Dynamic Track Stabilizer	No Further Restriction Required	80- Passenger 50- Freight*	8 Trains
Shoulder Ballast Cleaning	No Further Restriction Required	80- Passenger 50- Freight*	8 Trains

**50 mph is the maximum freight speed on Amtrak owned tracks.*

e) The first train requirement may be met by running high speed surfacing consist over the affected area. This consist shall be made up of the specialized MW equipment used in high speed surfacing for tamping, ballast regulating, and dynamic track stabilization coupled together for track travel. Accepted examples of this type of equipment are the inclusive consist as follows: MDZ, 08-Unimat Switch Tamper, 09-4s Combo Tamper, and Ballast Management System. Smaller equipment consists such as the MK-IV or Jackson 6700 tampers do not meet this requirement.

f) If multiple maintenance operations are performed on the same segment of track, the most restrictive speed listed in the table applies. Example: Out-of-face tie renewal is immediately followed by out-of-face surfacing with a track stabilizer at temperature below 60°F requires 80 mph restriction for passenger trains after the first train requirement has been fulfilled at 30 mph (tie installation is more restrictive than surfacing).

g) The restrictions required in Table 5.1 are the minimum to ensure safe train operations until the affected track stabilizes under traffic, and more restrictive measures must be taken when conditions do not meet requirements for the class of track.

h) When using Table 5.1, consideration must be given to areas where the Minimum Traffic requirement may not be met before the onset of higher temperatures; use the more restrictive speed if temperatures may exceed 80°F before the Minimum Traffic requirement is met.

i) The length of the restriction shall encompass the entire work area plus a minimum 500’ (approximately one tenth of a mile) in both directions.

j) When performing out-of-face lining and surfacing with a stabilizer, limit raise to 3” between passes with the stabilizer. Initial raise during TLM and undercutting operations may exceed 3”, but intermediate and final passes must follow and be performed per this requirement.

k) The Minimum Traffic requirements specified in Table 5.1 may also be satisfied by traveling a work train consisting of an engine and at least two loaded cars over the affected area the required number of times not exceeding the maximum allowable speed. The supervisor of the operation will notify the dispatcher to enter the number of trains traveled over the affected area into the Unusual Occurrence Log.

Chapter 6 Rail Joint Inspections

CWR Joint means any joint directly connected to CWR. See 6.4 for clarification on requirements around interlockings and other special trackwork.

6.1 CWR Joint Inspection Responsibility

Each Assistant Division Engineer of Track or their designee is responsible for ensuring inspections are completed at the required frequency and keeping required documentation for these CWR joint inspections within their territory. Only CWR qualified individuals will perform the special rail joint inspections in CWR track.

6.2 Frequency of Inspections

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

Minimum Number of Inspections Per Calendar Year

Class of Track	Frequency	Time periods
4 & above (with Freight Trains greater than 60 MGT annually)	Four (4) times per year with minimum of 60 days between inspections	January- March April- June July- September October-December
4 & above (with Passenger and /or Freight Trains with 60 MGT or less annually)	Three (3) times per year with minimum of 90 days between inspections	January- April May- August September- October
2 & 3	Twice per year (2) year with minimum of 120 days between inspections	January- June July- December
Class 1	Not required	

a) A Division Manager qualified in these CWR Procedures, Track Supervisor, and Track Inspector must be in attendance together during at least one of the above inspections.

b) The balance of the rail joint inspections must be conducted by a track inspector minimally.

c) When extreme weather conditions prevent an inspection of a territory within the required interval, the division may request permission form the Deputy Chief Engineer of Track to 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 section 6.5 shall be identified in the inspection record as to location by specifying the subdivision, milepost, track number and rail (north, south, etc.).

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 the following:

a) 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.

b) At crossovers:
   - All joints in track between switches.

c) 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.

d) At lift rail assemblies or other transition devices on movable bridges:
   - All joints immediately attached to the rail assembly or transition device.

6.5 Rail Joint Conditions and Actions

When inspecting CWR joints, inspectors must watch for (but not be limited to) the rail joint conditions outlined in the following table. When such conditions are found, the appropriate action must be taken as outlined.

Table 6.5.1- RAIL JOINT CONDITION/ ACTION

Rail Joint Condition	Action (1)
Visible cracks in joint bar	Replace bar
Loose/ bent/ frozen bolts	Tighten or replace bolts
Missing bolts[2]	Replace bolts
Tie(s) not effectively supporting joint	Tamp tie(s) Replace or repair tie(s) **OR** Conduct follow-up inspections until repaired/removed [4]
Broken shoulders & clips or missing clips, pads & insulators	Replace tie, clips, pads & Insulators
Broken or missing tie plate(s)	Replace tie plate(s) **OR** Conduct follow-up inspections until repaired/removed [4]
Deteriorated insulated joint	Replace/repair joint **OR** Conduct follow-up inspections until repaired/removed [4]
Rail end batter greater than allowable for class of track (MW 1000 §213.117 & §213.0117)	Repair by welding joint or removing rail **OR** Conduct follow-up inspections until repaired/removed [4]
Rail end mismatch greater than allowable for class of track	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
Rail gap greater than 1 1/2”	Adjust rail gap /eliminate joint within 30 days
Joint vertical movement (profile) that exceeds maintenance limits for the designated class of track [3]	Surface joint **OR** Conduct follow-up inspections until repaired/removed [4]
Joint lateral movement (in a curve or spiral that exceeds maintenance limits for the designated class of track [3]	Correct lateral movement **OR** Conduct follow-up inspections until repaired/removed [4]

1. Action may also consist of placing a speed restriction or removing the track from service.
2. A minimum of two (2) effective 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. Monitor location(s) on foot during regular track inspection as prescribed by §213.233.

6.6 Embedded Joints

a) 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.

b) Temporarily Embedded 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 must still be inspected at the frequency specified above.

c) Whenever possible remove/eliminate embedded joints and do not create new embedded joints.

6.7 Inspection Records

a) On-foot periodic and follow up inspections of rail joints in CWR are to be documented and stored in the Amtrak electronic inspection work order system- Maximo.

b) Information that must be contained in the documented inspection includes:

- Date of the inspection
- Limits of the inspection
- Location and nature of any CWR joint conditions specified in section 6.5
- Corrective or remedial action for joint conditions
- Name and signature of the inspector

c) Track subject to inspections under this plan, 49 CFR §213.119, and §213.343 must comply with (*reference to sections under 49 CFR Part 213 and the equivalent section in MW 1000 shown in parenthesis*):

- Track Inspections (MW 1000 §213.233, MW 1000 §213.0233, 49 CFR §213.233, 49 CFR §213.365),
- Inspections of switches, turnouts, track crossings, lift rail assemblies or other transition devices on moveable bridges (MW 1000 §213.235(TO), MW 1000 §213.231(MR), 49 CFR §213.235), if applicable,
- Periodic and follow-up CWR Joint Inspections as contained herein this plan (49 CFR §213.119(g)).

Chapter 7 Seasonal and Extreme Weather Inspections and Protective Measures

7.1 General Speed Restrictions Due to High Heat

a) Amtrak has installed numerous weather stations throughout its territories that monitor rail and ambient temperatures as well other weather conditions at regular intervals. These weather stations shall be used to determine when general speed restrictions need to be applied for high heat. A list of the stations with their designated affected territories is found in the Appendices.

b) During periods of high heat (ambient above 90°F) rail temperatures shall be monitored by the Division Engineer's designee to determine when and where speed restrictions are necessary for their affected territories.

c) General speed restrictions will be applied as follows:

Level	Rail Temp	Ambient Temp	Speed Restriction	Tracks	Zone
Level 1	>127°F	>95°F	Do Not Exceed: 100 MPH	All	Between stations as determined by IMCS Department
Level 2	≥135°F	≥102°F	Do Not Exceed: 80 MPH	All	
Level 3	*To be determined by install temperature*	N/A	Do Not Exceed: 30(P)/25(F) MPH	All	

d) In the absence of rail temperature data, the ambient temperature reported by the National Weather Service shall be used.

e) The Division Engineer or their designee may choose to impose or continue these restrictions at temperatures less than those shown above or preemptively publish them in the Temporary Speed Restriction Bulletin for the following day when forecast conditions are likely to require them.

7.2 Spring and Fall Inspections

a) In the Spring, between March 1 and April 30, a visual inspection of all main track will be conducted. This inspection will be made by a Division Manager in the company of the Track Supervisor and Track Inspector. The Assistant Track Supervisor may be used if more than one inspection party is required at one time on a subdivision. The inspection will concentrate on compliance with standards in the following areas:

1. Anchor Pattern
2. Anchor Position
3. Ballast Section
4. Evidence of longitudinal and lateral rail movement, particularly at fixed locations, such as turnouts and grade crossings (high-compressive forces)
5. Fasteners
6. Drainage and Roadbed Stability

b) In the Fall, between September 1 and October 30, a visual inspection of all main track will be conducted. This inspection will be made by a Division Manager in the company of the Track Supervisor and Track Inspector. The Assistant Track Supervisor may be used if more than one inspection party is required at one time on a subdivision. The inspection will concentrate on compliance with standards in the following areas:

1. Winterization Needs
2. Fasteners

3. Drainage and Roadbed Stability
4. Anchor Pattern
5. Anchor Position
6. Ballast Section
7. Evidence of longitudinal and lateral rail movement, particularly at fixed locations, such as turnouts and grade crossings (high-tensile forces)

c) The Division Engineer or designee will, upon completion of the inspection, submit to the Deputy Chief Engineer of Track a summary of findings and the protective/corrective actions taken or planned.

7.3 Hot Weather Inspections

a) When the ambient air temperature is forecast to exceed 90°F for the first five occurrences of the calendar year then 95°F thereafter, Heat Patrols will be performed on all main tracks in the affected territory by CWR qualified Track Inspectors. Patrols will be conducted during the heat of the day, generally between hours of 12:00 and 19:00. Patrols at lesser temperatures may be initiated by the Division Engineer or designee but must be performed during the time when temperatures exceed the thresholds above. The Track Inspector will fill out a Special Track Occurrence Report (NRPC 2880), Report E for this inspection and submit it to the Supervisor of Track. See Appendix for Report E and instructions.

b) During this inspection, the Track Inspector must be on the lookout for:

1. Wavy track,
2. Rail canting or lifting out of tie plates
3. Longitudinal rail movement or shiny marks on the base of the rail indicating rail is running through anchors or clips
4. Kinked joints in compression and
5. Evidence of lateral track movement (gaps in ballast at tie ends, churning ballast)

c) The inspector must also be aware that the following conditions may increase the possibility of buckling and pay special attention to them:

1. Recently worked track (track worked within 7 days)
2. Mud spots
3. Existing deviations in line and surface
4. Track at the bottom of sags
5. Fixed track structures (i.e., turnouts, road crossings, bridges, etc.)
6. Sub-standard ballast section
7. Sub-standard anchor pattern

8. Areas where heavy braking or acceleration may occur such as station platforms and curves
9. Locations where rail has been repaired or welds made

d) If track is found to have indications of probable buckling, depending on severity, track must be restricted to 10 mph or less or taken out of service until repair or adjustment is made.

7.4 Cold Weather Inspections

a) During extreme cold weather conditions, a special main track inspection may be required. The Deputy Chief Engineer of Track or their designee, at their discretion, will initiate a cold weather inspection. The Track Inspector will fill out a Special Track Occurrence Report (NRPC 2880), Report E for this inspection and submit it to the Supervisor of Track. See Appendix for Report E and instructions.

   Inspectors will inspect, at a minimum, for:

   1. Broken rails
   2. Bent/broken bolts
   3. Pull-aparts
   4. Curve movement
   5. Wide gap between rail-ends (greater than 1-1/2”)
   6. Cracked or broken joint bars (conventional and insulated)

Chapter 8 Training

In addition to being provided a copy of these written procedures as well as the Amtrak MW 1000 manual, all Amtrak employees responsible for the inspection, installation, adjustment or maintenance of CWR track must complete training on these CWR procedures every calendar year. Amtrak provides this training as a separate module but in conjunction with its MW 1000 training on the Limits and Specifications for the Safety, Maintenance, and Construction of Track both in an in depth four-week initial course and during recurrent annual training. This includes inspection of track, prescribed remedial actions to safely compensate for deviations from the requirements of the Track Safety Standards of the FRA in accordance with the requirements in Part 213.7 and 213.305 in addition to ongoing certification on written Continuously Welded Rail (CWR) procedures in accordance with Part 213.119 and 213.343 (reference Amtrak course number 5669). Amtrak has combined these two requirements together in order to make one annual requirement. Every MW1000 qualified employee must attend this course annually to maintain their qualification. This course not only meets the CWR training requirement but also helps reinforce track safety standards annually for employees who are qualified in MW1000. The module that covers CWR in this training addresses but is not necessarily limited to:

- CWR installation procedures
- Rail anchoring requirements when installing CWR
- Maintaining a desired rail neutral temperature range
- Preventive maintenance on existing CWR track
- Monitoring curve movement following track surfacing and lining
- Placing temporary speed restrictions account of track work
- Rail joint inspections
- Insufficient ballast
- Extreme weather inspections
- Recordkeeping

The Amtrak Department of Human Resources- Employee Development, maintains the list of MW 1000 and CWR qualified employees. This list shall be made available to the Deputy Chief Engineer of Track and FRA upon request.

Chapter 9 Recordkeeping

All records listed herein shall be kept and maintained for a period of not less than one year after the work has been completed and all adjustments made. The Division office is responsible for keeping these records and shall provide copies to the Deputy Chief Engineer of Track and the FRA upon request. The forms for the reports listed below are found in the Appendices.

9.1 Report A- Record of Track Disturbance (See also Chapter 3)

This report shall be filled out by the employee in charge of the operations when CWR track is cut, broken, or disturbed for any reason. One copy shall be kept by the employee with additional copies sent to the Track Supervisor, Assistant Division Engineer of Track, and System Track Office. Copies of any updates to the original report shall be sent to the same. The Division office is responsible for monitoring these reports to ensure necessary protective and/or corrective action including RNT adjustment is made. All reports that require further action in accordance with these procedures must be kept for a period of not less than one year from the date of final corrective action.

9.2 Report B- Report of Track Movement Due to Surfacing and Lining of Curves (See also Chapter 4)

For track receiving out-of-face surfacing and lining, a “Report of Track Movement Due to Surfacing” (Report B) will be made for each curve worked. This report will be completed by the CWR qualified employee in charge of the operation. When Report B is completed, one copy will be kept by the employee with additional copies sent to the Track Supervisor, Assistant Division Engineer of Track, and System Track Office.

9.3 Report C- Summary of Track Disturbances

This report is a summary of all track disturbances (Report A’s) requiring corrective and protective action. The log shall include any locations where RNT has been affected outside of the safe range, and/or any trackwork currently under a speed restriction for track disturbance. The Division office is responsible for completing this report and updating weekly with copy sent to the SystemTrack Office.

9.4 Report D- Record of Rail Neutral Temperature (See also Chapter 1)

This Report shall be completed for all new CWR installations and anytime the RNT is adjusted from its original temperature. It does not apply to plug rails that are adjusted back to their original RNT within the safe zone using the break charts as described in Chapter 3. One copy shall be kept by the CWR qualified employee in charge of the operation with additional copies sent to the Track Supervisor, Assistant Division Engineer of Track, and the System Track office. The Division office is responsible for maintaining and keeping these reports and updating their records of rail laying temperature in accordance with Engineering Practice 2304.

9.5 Report E- Special Track Occurrence Report (See also Chapter 7)

This Report is to be filled out during weather related inspections in CWR. One copy shall be kept by the inspector with copy sent to the Track Supervisor, and Assistant Division Engineer of Track for the territory.

LIST OF APPENDICES

CWR ADJUSTMENT TABLE (INCHES)

Temp. Diff.	Length of CWR in Feet									
	200	**400**	**600**	**800**	**1000**	**1200**	**1400**	**1600**	**1800**	**2000**
10	1/8	1/4	1/2	5/8	3/4	7/8	1 1/8	1 1/4	1 3/8	1 1/2
15	1/4	1/2	3/4	7/8	1 1/8	1 3/8	1 5/8	1 7/8	2 1/8	2 3/8
20	1/4	5/8	7/8	1 1/4	1 1/2	1 7/8	2 1/8	2 1/2	2 3/4	3 1/8
25	3/8	3/4	1 1/8	1 1/2	2	2 3/8	2 3/4	3 1/8	3 1/2	3 7/8
30	1/2	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
35	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
40	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
45	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
50	3/4	1 1/2	2 3/8	3 1/8	3 7/8	4 5/8	5 1/2	6 1/4	7	7 3/4
55	7/8	1 3/4	2 5/8	3 3/8	4 1/4	5 1/8	6	6 7/8	7 3/4	8 5/8
60	7/8	1 7/8	2 3/4	3 3/4	4 5/8	5 5/8	6 1/2	7 1/2	8 3/8	9 3/8
65	1	2	3	4	5 1/8	6 1/8	7 1/8	8 1/8	9 1/8	10 1/8
70	1 1/8	2 1/8	3 1/4	4 3/8	5 1/2	6 1/2	7 5/8	8 3/4	9 7/8	10 7/8
75	1 1/8	2 3/8	3 1/2	4 5/8	5 7/8	7	8 1/4	9 3/8	10 1/2	11 3/4
80	1 1/4	2 1/2	3 3/4	5	6 1/4	7 1/2	8 3/4	10	11 1/4	12 1/2
85	1 3/8	2 5/8	4	5 1/4	6 5/8	8	9 1/4	10 5/8	11 7/8	13 1/4
90	1 3/8	2 3/4	4 1/4	5 5/8	7	8 3/8	9 7/8	11 1/4	12 5/8	14
95	1 1/2	3	4 1/2	5 7/8	7 3/8	8 7/8	10 3/8	11 7/8	13 3/8	14 7/8
100	1 1/2	3 1/8	4 5/8	6 1/4	7 3/4	9 3/8	10 7/8	12 1/2	14	15 5/8

$(TRNT-T_a) \times L \times 0.000078 = A$

TRNT = Target Rail Neutral Temperature
T_a = Actual Rail Neutral Temperature
L = Length of rail (feet)
A = Adjustment (inches)

Use Break Chart 1 for tracks with the following characteristics:

- Conventional Wood tie tracks with spikes & anchors on **every other tie**
- Rail Sizes: 105lb, 107lb,112lb, 115lb, 119lb

BREAK CHART 1: 5.5" RAIL BASE, EVERY OTHER TIE ANCHORED																	
Rail Break Temp	***GAP IN INCHES***																
	0.25	***0.5***	***0.75***	***1***	***1.25***	***1.5***	***2***	***2.5***	***3***	***3.5***	***4***	***4.5***	***5***	***5.5***	***6***	***7***	***8***
120	141	149	156	161	166	171	179	185	192	197	203	208	213	217	221	230	237
115	136	144	151	156	161	166	174	180	187	192	198	203	208	212	216	225	232
110	131	139	146	151	156	161	169	175	182	187	193	198	203	207	211	220	227
105	126	134	141	146	151	156	164	170	177	182	188	193	198	202	206	215	222
100	121	129	136	141	146	151	159	165	172	177	183	188	193	197	201	210	217
95	116	124	131	136	141	146	154	160	167	172	178	183	188	192	196	205	212
90	111	119	126	131	136	141	149	155	162	167	173	178	183	187	191	200	207
85	106	114	121	126	131	136	144	150	157	162	168	173	178	182	186	195	202
80	101	109	116	121	126	131	139	145	152	157	163	168	173	177	181	190	197
75	96	104	111	116	121	126	134	140	147	152	158	163	168	172	176	185	192
70	91	99	106	111	116	121	129	135	142	147	153	158	163	167	171	180	187
65	86	94	101	106	111	116	124	130	137	142	148	153	158	162	166	175	182
60	81	89	96	101	106	111	119	125	132	137	143	148	153	157	161	170	177
55	76	84	91	96	101	106	114	120	127	132	138	143	148	152	156	165	172
50	71	79	86	91	96	101	109	115	122	127	133	138	143	147	151	160	167
45	66	74	81	86	91	96	104	110	117	122	128	133	138	142	146	155	162
40	61	69	76	81	86	91	99	105	112	117	123	128	133	137	141	150	157
35	56	64	71	76	81	86	94	100	107	112	118	123	128	132	136	145	152
30	51	59	66	71	76	81	89	95	102	107	113	118	123	127	131	140	147
25	46	54	61	66	71	76	84	90	97	102	108	113	118	122	126	135	142
20	41	49	56	61	66	71	79	85	92	97	103	108	113	117	121	130	137
15	36	44	51	56	61	66	74	80	87	92	98	103	108	112	116	125	132
10	31	39	46	51	56	61	69	75	82	87	93	98	103	107	111	120	127
5	26	34	41	46	51	56	64	70	77	82	88	93	98	102	106	115	122
0	21	29	36	41	46	51	59	65	72	77	83	88	93	97	101	110	117
-5	16	24	31	36	41	46	54	60	67	72	78	83	88	92	96	105	112
-10	11	19	26	31	36	41	49	55	62	67	73	78	83	87	91	100	107
-15	6	14	21	26	31	36	44	50	57	62	68	73	78	82	86	95	102
-20	1	9	16	21	26	31	39	45	52	57	63	68	73	77	81	90	97
SHADED REGION = "SAFE RANGE"																	

Use Break Chart 2 for tracks with the following characteristics:

- Conventional Wood tie tracks with spikes & anchors on every tie
- Fully clipped wood tie tracks
- Concrete tie tracks
- Rail Sizes: 105lb, 107lb, 112lb, 115lb, 119lb

BREAK CHART 2: 5.5" RAIL BASE, EVERY TIE ANCHORED/ ELASTIC FASTENERS																	
Rail Break Temp	***GAP IN INCHES***																
	0.25	***0.5***	***0.75***	***1***	***1.25***	***1.5***	***2***	***2.5***	***3***	***3.5***	***4***	***4.5***	***5***	***5.5***	***6***	***7***	***8***
120	145	155	162	169	175	180	189	197	205	212	218	224	230	235	240	250	259
115	140	150	157	164	170	175	184	192	200	207	213	219	225	230	235	245	254
110	135	145	152	159	165	170	179	187	195	202	208	214	220	225	230	240	249
105	130	140	147	154	160	165	174	182	190	197	203	209	215	220	225	235	244
100	125	135	142	149	155	160	169	177	185	192	198	204	210	215	220	230	239
95	120	130	137	144	150	155	164	172	180	187	193	199	205	210	215	225	234
90	115	125	132	139	145	150	159	167	175	182	188	194	200	205	210	220	229
85	110	120	127	134	140	145	154	162	170	177	183	189	195	200	205	215	224
80	105	115	122	129	135	140	149	157	165	172	178	184	190	195	200	210	219
75	100	110	117	124	130	135	144	152	160	167	173	179	185	190	195	205	214
70	95	105	112	119	125	130	139	147	155	162	168	174	180	185	190	200	209
65	90	100	107	114	120	125	134	142	150	157	163	169	175	180	185	195	204
60	85	95	102	109	115	120	129	137	145	152	158	164	170	175	180	190	199
55	80	90	97	104	110	115	124	132	140	147	153	159	165	170	175	185	194
50	75	85	92	99	105	110	119	127	135	142	148	154	160	165	170	180	189
45	70	80	87	94	100	105	114	122	130	137	143	149	155	160	165	175	184
40	65	75	82	89	95	100	109	117	125	132	138	144	150	155	160	170	179
35	60	70	77	84	90	95	104	112	120	127	133	139	145	150	155	165	174
30	55	65	72	79	85	90	99	107	115	122	128	134	140	145	150	160	169
25	50	60	67	74	80	85	94	102	110	117	123	129	135	140	145	155	164
20	45	55	62	69	75	80	89	97	105	112	118	124	130	135	140	150	159
15	40	50	57	64	70	75	84	92	100	107	113	119	125	130	135	145	154
10	35	45	52	59	65	70	79	87	95	102	108	114	120	125	130	140	149
5	30	40	47	54	60	65	74	82	90	97	103	109	115	120	125	135	144
0	25	35	42	49	55	60	69	77	85	92	98	104	110	115	120	130	139
-5	20	30	37	44	50	55	64	72	80	87	93	99	105	110	115	125	134
-10	15	25	32	39	45	50	59	67	75	82	88	94	100	105	110	120	129
-15	10	20	27	34	40	45	54	62	70	77	83	89	95	100	105	115	124
-20	5	15	22	29	35	40	49	57	65	72	78	84	90	95	100	110	119
SHADED REGION = "SAFE RANGE"																	

Use Break Chart 3 for tracks with the following characteristics:

- Conventional Wood tie tracks with spikes & anchors on **every other tie**
- Rail Sizes: 127lb, 130lb, 131lb, 132lb, 133lb, 136lb, 140lb, 152lb, 155lb

BREAK CHART 3: 6" RAIL BASE, EVERY OTHER TIE ANCHORED																	
Rail Break Temp	***GAP IN INCHES***																
	0.25	***0.5***	***0.75***	***1***	***1.25***	***1.5***	***2***	***2.5***	***3***	***3.5***	***4***	***4.5***	***5***	***5.5***	***6***	***7***	***8***
120	139	147	153	158	163	167	174	180	186	192	196	201	205	210	214	221	228
115	134	142	148	153	158	162	169	175	181	187	191	196	200	205	209	216	223
110	129	137	143	148	153	157	164	170	176	182	186	191	195	200	204	211	218
105	124	132	138	143	148	152	159	165	171	177	181	186	190	195	199	206	213
100	119	127	133	138	143	147	154	160	166	172	176	181	185	190	194	201	208
95	114	122	128	133	138	142	149	155	161	167	171	176	180	185	189	196	203
90	109	117	123	128	133	137	144	150	156	162	166	171	175	180	184	191	198
85	104	112	118	123	128	132	139	145	151	157	161	166	170	175	179	186	193
80	99	107	113	118	123	127	134	140	146	152	156	161	165	170	174	181	188
75	94	102	108	113	118	122	129	135	141	147	151	156	160	165	169	176	183
70	89	97	103	108	113	117	124	130	136	142	146	151	155	160	164	171	178
65	84	92	98	103	108	112	119	125	131	137	141	146	150	155	159	166	173
60	79	87	93	98	103	107	114	120	126	132	136	141	145	150	154	161	168
55	74	82	88	93	98	102	109	115	121	127	131	136	140	145	149	156	163
50	69	77	83	88	93	97	104	110	116	122	126	131	135	140	144	151	158
45	64	72	78	83	88	92	99	105	111	117	121	126	130	135	139	146	153
40	59	67	73	78	83	87	94	100	106	112	116	121	125	130	134	141	148
35	54	62	68	73	78	82	89	95	101	107	111	116	120	125	129	136	143
30	49	57	63	68	73	77	84	90	96	102	106	111	115	120	124	131	138
25	44	52	58	63	68	72	79	85	91	97	101	106	110	115	119	126	133
20	39	47	53	58	63	67	74	80	86	92	96	101	105	110	114	121	128
15	34	42	48	53	58	62	69	75	81	87	91	96	100	105	109	116	123
10	29	37	43	48	53	57	64	70	76	82	86	91	95	100	104	111	118
5	24	32	38	43	48	52	59	65	71	77	81	86	90	95	99	106	113
0	19	27	33	38	43	47	54	60	66	72	76	81	85	90	94	101	108
-5	14	22	28	33	38	42	49	55	61	67	71	76	80	85	89	96	103
-10	9	17	23	28	33	37	44	50	56	62	66	71	75	80	84	91	98
-15	4	12	18	23	28	32	39	45	51	57	61	66	70	75	79	86	93
-20	-1	7	13	18	23	27	34	40	46	52	56	61	65	70	74	81	88
SHADED REGION = "SAFE RANGE"																	

Use Break Chart 4 for tracks with the following characteristics:

- Conventional Wood tie tracks with spikes & anchors on every tie
- Fully clipped wood tie tracks
- Concrete tie tracks
- Rail Sizes: 127lb, 130lb, 131lb, 132lb, 133lb, 136lb, 140lb, 152lb, 155lb

BREAK CHART 4: 6" RAIL BASE, EVERY TIE ANCHORED/ ELASTIC FASTENERS																	
Rail Break Temp	***GAP IN INCHES***																
	0.25	***0.5***	***0.75***	***1***	***1.25***	***1.5***	***2***	***2.5***	***3***	***3.5***	***4***	***4.5***	***5***	***5.5***	***6***	***7***	***8***
120	143	152	159	165	171	175	184	192	198	205	210	216	221	226	231	240	248
115	138	147	154	160	166	170	179	187	193	200	205	211	216	221	226	235	243
110	133	142	149	155	161	165	174	182	188	195	200	206	211	216	221	230	238
105	128	137	144	150	156	160	169	177	183	190	195	201	206	211	216	225	233
100	123	132	139	145	151	155	164	172	178	185	190	196	201	206	211	220	228
95	118	127	134	140	146	150	159	167	173	180	185	191	196	201	206	215	223
90	113	122	129	135	141	145	154	162	168	175	180	186	191	196	201	210	218
85	108	117	124	130	136	140	149	157	163	170	175	181	186	191	196	205	213
80	103	112	119	125	131	135	144	152	158	165	170	176	181	186	191	200	208
75	98	107	114	120	126	130	139	147	153	160	165	171	176	181	186	195	203
70	93	102	109	115	121	125	134	142	148	155	160	166	171	176	181	190	198
65	88	97	104	110	116	120	129	137	143	150	155	161	166	171	176	185	193
60	83	92	99	105	111	115	124	132	138	145	150	156	161	166	171	180	188
55	78	87	94	100	106	110	119	127	133	140	145	151	156	161	166	175	183
50	73	82	89	95	101	105	114	122	128	135	140	146	151	156	161	170	178
45	68	77	84	90	96	100	109	117	123	130	135	141	146	151	156	165	173
40	63	72	79	85	91	95	104	112	118	125	130	136	141	146	151	160	168
35	58	67	74	80	86	90	99	107	113	120	125	131	136	141	146	155	163
30	53	62	69	75	81	85	94	102	108	115	120	126	131	136	141	150	158
25	48	57	64	70	76	80	89	97	103	110	115	121	126	131	136	145	153
20	43	52	59	65	71	75	84	92	98	105	110	116	121	126	131	140	148
15	38	47	54	60	66	70	79	87	93	100	105	111	116	121	126	135	143
10	33	42	49	55	61	65	74	82	88	95	100	106	111	116	121	130	138
5	28	37	44	50	56	60	69	77	83	90	95	101	106	111	116	125	133
0	23	32	39	45	51	55	64	72	78	85	90	96	101	106	111	120	128
-5	18	27	34	40	46	50	59	67	73	80	85	91	96	101	106	115	123
-10	13	22	29	35	41	45	54	62	68	75	80	86	91	96	101	110	118
-15	8	17	24	30	36	40	49	57	63	70	75	81	86	91	96	105	113
-20	3	12	19	25	31	35	44	52	58	65	70	76	81	86	91	100	108
SHADED REGION = "SAFE RANGE"																	

REPORT- A
RECORD OF TRACK DISTURBANCE

Date:_____ Line:_____ Track No.:_____

MP from or at:_____ MP to:_____

Gang #:_____ Foreman:_____

Type of Work Performed:_____

Ambient Temp:____°F Rail Temps: Start:____°F Finish:____°F

Type of Ties: ☐Wood ☐Concrete ☐Direct Fixation ☐Other (include in Remarks)

Anchor Pattern: ☐Every Tie ☐Every Other Tie ☐Elastic Fasteners

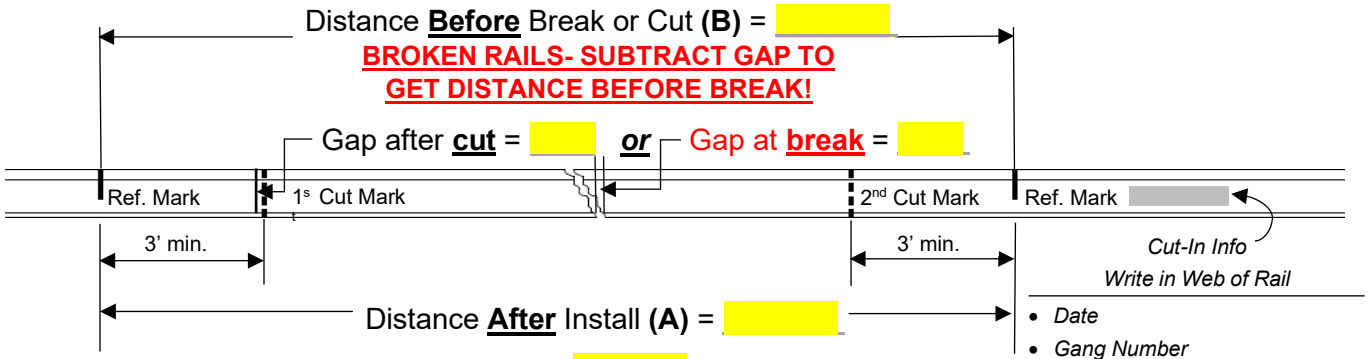
Anchoring Pattern and Maintenance in Accordance with Chapter 2: ☐Yes ☐No

Remarks:_____

FILL OUT REMAINDER OF THIS REPORT ANY TIME RAIL IS CUT OR BROKEN

Rail Section:_____ Rail Side: ☐North ☐South ☐East ☐West Gap at Break or First Cut:____

INITIAL CUT FOR PLUG RAIL INSTALL OR DE-STRESSING:



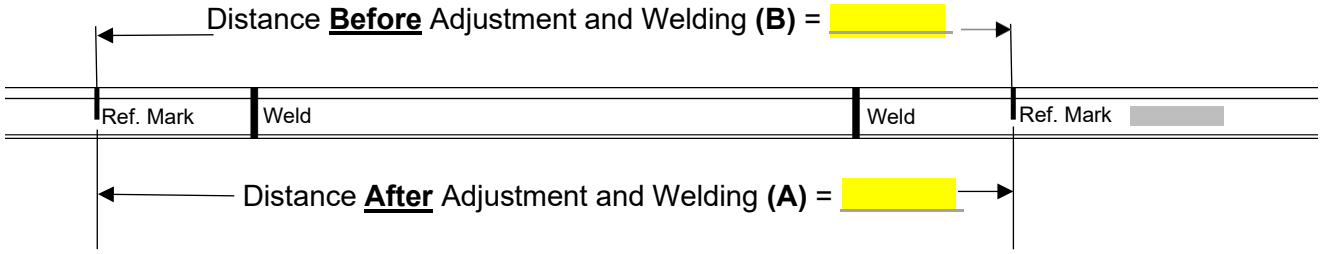
Rail Added(+) or Removed(-) = (A) – (B) =_____

Established RNT:____ °F

Cut-In Info
Write in Web of Rail

- *Date*
- *Gang Number*
- *Gap at 1ST cut or break*
- *Rail Temp*
- *Distance between ref. marks **before** cut or break= (B) (Remember to subtract gap for broken rails*

INTERIM / FINAL RNT ADJUSTMENT AND WELDING:



Method of Adjustment: ☐Rail Heater ☐Mechanical Stretcher ☐Natural Temperature Change

Rail Added(+) or Removed(-) = (A) – (B) =_____

Established RNT:____ °F

REPORT- B

REPORT OF TRACK MOVEMENT DUE TO SURFACING AND LINING OF CURVES

Date:_____ Line:_____ Track No.: _____

MP from or at:_____ MP to: _____

Gang #:_____ Foreman: _____

Ambient Temp:_____°F Rail Temps, Start:_____°F Completion:_____°F

Remarks:

Point Number	Offset			Notes
	Before Surfacing	Immediately After Surfacing	After Train Traffic	

REPORT-C
SUMMARY OF TRACK DISTURBANCES

Division:

Week of:

ID	Date on Report A	Subdivision	MP From	MP to	Type of Work	Plug Rail Installation Temp if Applicable	RNT for Panel Track, or Other CWR install	Speed Restriction	Duration
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Attach Copies of Report A; Use Additional Sheets as Required. One Copy to System Track Office

REPORT- D

RECORD OF RAIL NEUTRAL TEMPERATURE

Date:_____ Line:_____ Track No.: _____

MP from or at:_____ MP to: _____

Gang #:_____ Foreman: _____

Ambient Temp:____°F Rail Laying Temps, Start:____°F Established RNT: ___°F

Rail Side: ☐North ☐South ☐East ☐West Rail Section: _____

Type of Ties: ☐Wood ☐Concrete ☐Direct Fixation ☐Other (include in Remarks)

Anchor Pattern: ☐Every Tie ☐Every Other Tie ☐Elastic Fasteners

Anchoring Pattern and Maintenance in Accordance with Chapter 2: ☐Yes ☐No

Remarks:

FILL OUT REMAINDER OF THIS REPORT WHEN ADJUSTING RAIL NEUTRAL TEMPERATURE

Method of Adjustment: ☐Rail Heater ☐Mechanical Stretcher ☐Natural Temperature Change

Calculations (Chapter 1.6):

Rail Temp (T_a) = _____ Temp Differential (TRNT - T_a) = _____ Length of Rail (L) = _____

Amount of Adjustment Required in Inches (A) = (TRNT-T_a) x L x 0.000078 = _____

Match Marks (Chapter 1.7):

Point Number	Distance from Start of Adjustment	Calculated Adjustment	Actual Adjustment	Notes

Actual Amount of Adjustment Achieved at End = _____

REPORT- E

SPECIAL TRACK OCCURRENCE REPORT

Date: Subdivision:

Inspector:

Reason for Inspection:

Inspected the following tracks:

TRACK	MP FROM	MP TO

TRACK	MP FROM	MP TO

TRACK	MP FROM	MP TO

The following conditions were found with action taken as noted (if none, complete first line with "NO CONDITIONS NOTED"):

CONDITION	TRACK	LOCATION	ACTION TAKEN AND/OR OTHER REMARKS

Send copy of this report to: Asst. Division Engineer- Track, and Supervisor

TRNT Table for Specific Locations

ID	Amtrak Line Code	Subdivision	MP from	MP to	Track Number(s)	Description	TRNT (°F)

http://tkenapp81p.amtrak.ad.nrpc/

Weather & Rail Temperature Monitoring Stations

Governing Territory		Weather Station Location	City, State	Line Code	MP	Alternate Site
	NEC SPINE					
1	**Avenue to Bowie**	**CARROLL**	**New Carrollton, MD**	**AP**	**127.0**	**BWI STATION**
	Washington Terminal	*- Use Carroll Weather Station to trigger Heat Inspections*				*Local Weather Service*
2	**Bowie to Bridge**	**BWI STATION**	**Linthicum Heights, MD**	**AP**	**106.3**	**CARROLL**
	Bridge to Baltimore	*- Use BWI Weather Station to trigger Heat Inspections*				*Local Weather Service*
	Baltimore to Bay	*- Use Edgewood Weather Station to trigger Heat Inspections*				*Local Weather Service*
3	**Bay to Bush**	**EDGEWOOD**	**Edgewood, MD**	**AP**	**75.0**	**PRINCE**
4	**Bush to Bacon**	**PRINCE**	**Principio, MD**	**AP**	**57.3**	**EDGEWOOD or RUTHBY**
5	**Bacon to Yard**	**RUTHBY**	**Newark, DE**	**AP**	**36.5**	**PRINCE**
	Yard to Landlith	*- Use Wilmington Weather Station to trigger Heat Inspections*				*Local Weather Service*
6	**Landlith to Phil**	**WILMINGTON**	**Wilmington, DE**	**AP**	**25.3**	**ZOO**
	Phil to Shore	*- Use Zoo Weather Station to trigger Heat Inspections*				*Local Weather Service*
7	**Shore to MP 76**	**GIRARD (ZOO)**	**Philadelphia, PA**	**AN**	**87.7**	**GRUNDY**
8	**MP 76 to Ham**	**GRUNDY**	**Bristol, PA**	**AN**	**65.3**	**MIDWAY**
9	**Ham to County**	**MIDWAY**	**Monmouth Junction, NJ**	**AN**	**41.0**	**GRUNDY or UNION**
10	**County to Hunter**	**UNION**	**Rahway, NJ**	**AN**	**20.0**	**MIDWAY**
	Hunter to Penn Station	*- Use Union Weather Station to trigger Heat Inspections & Speed Restrictions*				*Local Weather Service*
	Penn Station to Shell	*- Use Local Weather Data to trigger Heat Inspections & Speed Restrictions*				*Local Weather Service*
11	**Mill River to Conn**	**CLINTON**	**Clinton, CT**	**AB**	**96.8**	**NEW LONDON**
12	**Conn to Mystic**	**NEW LONDON**	**New London, CT**	**AB**	**122.9**	**DAVISVILLE**
13	**Mystic to Warwick**	**DAVISVILLE**	**Wickford, RI**	**AB**	**168.0**	**CLINTON**
14	**Warwick to Attleboro**	**PROVIDENCE**	**Providence, RI**	**AB**	**187.2**	**MANSFIELD**
15	**Attleboro to Junction**	**MANSFIELD**	**Mansfield, MA**	**AB**	**201.0**	**TRANSFER**
16	**Junction to Tower 1**	**TRANSFER**	**Readville, MA**	**AB**	**218.5**	**MANSFIELD**
	HARRISBURG LINE					
17	**Zoo to Bryn Mawr**	**GIRARD (ZOO)**	**Philadelphia, PA**	**AN**	**87.7**	*Local Weather Service*
18	**Bryn Mawr to Downs**	**Frazer**	**Malvern, PA**	**AH**	**44.2**	**PARKESBURG**
19	**Downs to Leaman**	**PARKESBURG**	**Parkesburg, PA**	**AH**	**44.2**	**LANCASTER**
20	**Leaman to Roy**	**LANCASTER**	**Lancaster, PA**	**AH**	**68.0**	**ROY**
21	**Roy to State**	**ROY**	**Middletown, PA**	**AH**	**94.3**	**LANCASTER**
	SPRINGFIELD LINE					
22	**Mill River to Willow**	**MERIDEN**	**Meriden, CT**	**AS**	**18.6**	*Local Weather Service*
23	**Willow to Springfield**	**HARTFORD**	**Hartford, CT**	**AS**	**36.6**	*Local Weather Service*
	EMPIRE LINE					
24	**Division Post (MNR) to CP 103**	**RHINECLIFF**	**Rhinecliff, NY**	**AR**	**89.2**	*Local Weather Service*
25	**CP 103 to CP 125**	**HUDSON**	**Hudson, NY**	**AR**	**115.4**	**RHINECLIFF**
26	**CP 125 to CP 146**	**RENSSELAER**	**Albany, NY**	**AR**	**142.1**	*Local Weather Service*
27	**CP 146 to Schenectday**	**SCHENECTADY**	**Schenectady, NY**	**AR**	**159.8**	**RENSSELAER**
	MICHIGAN LINE					
28	**Porter to Dowagiac**	**NILES**	**Niles, MI**	**AM**	**192.0**	*Local Weather Service*
29	**Dowagiac to Kalamazoo**	**LAWTON**	**Lawton, MI**	**AM**	**160.8**	*Local Weather Service*
30	**Kalamazoo to Albion**	**BATTLE CREEK**	**Battle Creek, MI**	**AM**	**122.0**	*Local Weather Service*
31	**Albion to CP 52**	**JACKSON**	**Jackson, MI**	**AM**	**75.5**	*Local Weather Service*
32	**CP 52 to CP Townline**	**ANN ARBOR**	**Ann Arbor, MI**	**AM**	**37.5**	*Local Weather Service*