

CONTINUOUS WELDED RAIL

****From Berlin STP 2935(1)
Berlin NH STP 2938(1)
Berlin NH STP 2947(1)**

- xx. DESCRIPTION. This work shall consist of removing existing rails and furnishing and installing new continuous welded rail (CWR); inventorying, transporting, and stockpiling salvaged rail and Other Track Materials (OTM); scrapping of non-salvaged track materials; and de-stressing rail as required, at the locations indicated in the Plans and as directed by the Engineer.
- xx. SUBMITTAL REQUIREMENTS. Inventory of salvaged materials shall be submitted to the Engineer for review and approval.

Submit the following additional information for review and approval by the Engineer:

- (1) List of proposed equipment for use in construction. The list shall be submitted to the Engineer fifteen days prior to the start of work and shall include the name of any manufacturer of material, dimensions and weights of the equipment, and the intended use of each piece of equipment.
- (2) Proposed construction and procedures (Procedures) for rail installation. Procedures shall identify the sequence of work including distribution, installation, and pickup of materials. Procedures shall specify proposed equipment to be used, number of and classification of employees to be used, assumed hours of on-track work and off-track work, and assumed production rates. A projected schedule shall be provided for all activities.
- (3) Supervisor and/or foreman must be qualified to supervise certain track renewals as defined by FRA Track Safety Standards, Section 213.7.
- (4) Information, such as catalog cuts for bolts, spikes, insulated joints, rail anchors, and signal bonding material shall be furnished to the Engineer to verify proposed material is in conformance with specifications.

The following Other Track Material information shall be submitted to the Engineer prior to ordering materials:

- (1) Certificates of Compliance shall be provided for all materials furnished by the Contractor.
- (2) Samples of acceptable materials proposed for use prior to any construction. Any Contractor furnished materials which are installed in track and subsequently found to be defective shall be replaced by the Contractor at no additional cost to the Agency.
- (3) Fabrication Drawings of all major track material components for review and approval by the Engineer.

The following rail information shall be submitted to the Engineer prior to ordering materials:

- (1) Manufacturer's Catalog Data. Within 30 days of receipt of the Notice to Proceed, and before installation of the materials, a complete schedule of the materials proposed for installation and

the source of the material shall be submitted to the Engineer for review and approval. Information to be provided on rail shall include: rail weight, rail section, rail wear (if applicable for fit rail), drilling, typical rail length, date rolled, and the name of the mill where the rail was rolled.

xx. MATERIALS.

- (a) Approval of Materials. Within 20 calendar days of the Contractor's submittal of Manufacturer's Data or Certificates of Compliance, the Engineer will notify the Contractor of the materials acceptance or rejection. Rejected materials that have already been delivered to the project site shall be promptly segregated from the approved materials and removed from the premises. If materials are rejected, acceptable replacement materials shall be furnished by the Contractor at no additional cost to the Agency. Initial approval of materials will not prevent the removal and replacement of materials not meeting the requirements of these provisions or defective materials discovered during construction, inspection of the work, and routine QC/QA operations. If requested by the Contractor, the Engineer will make an off-site inspection of the rail proposed for use in this project. The Contractor shall bear all expenses incurred for this inspection.

- (b) Rail Furnished by the Contractor.

- (1) Rail. CWR to be installed within the limits of reconstructed grade crossings, as indicated on the Plans, shall be furnished by the Contractor.

In reconstructed grade crossing areas, 136 RE new or relay continuous welded rail shall be used.

New head hardened rail shall conform to the Specifications in Chapter 4 of the AREMA "Manual for Railway Engineering".

It is the goal of the project to have as few welds or joints as practical. New rail shall be furnished in 78 foot sections wherever possible. In no case shall new rail be furnished in lengths of less than 39 feet unless approved by the Engineer. Rail drilling shall be approved by the Engineer. Drilling shall be uniform and match existing drillings. Rail drillings shall be as specified in AREMA, Chapter 4, Part 1. Running rail ends that are not welded shall be drilled with six holes. The rail to be field welded shall have blank ends or only the rear hole drilled. The rail to be plant welded shall have blank ends.

- (2) End Condition. Rail ends shall be square and shall be cut with an approved abrasive rail saw. Torch cut rails will not be accepted.

Chipped rail ends greater than 1/16 inch shall not be allowed. Rail chips of 1/16 inch or less shall be removed by rail end slotting per AREMA Plan No. 1005-40.

- (3) Straightness. Rail ends shall have a deviation from a lateral (horizontal) line not to exceed a maximum mid-ordinate of 0.030 inch in 3 feet or 0.023 inch at the end quarter point of a 3 foot chord.

Rails shall be straight horizontally, except that not more than 10 percent of the order may have lateral side sweep not greater than that indicated by a mid-ordinate of 1/2 inch in 30 feet.

Rails and rail ends shall be straight vertically with no upsweep or droop permissible.

- (4) Relay Rail. Relay rail having any of the following defects or exceeding the following wear limits shall not be accepted:

- a. Bolt hole cracks or breaks, broken base, breaks, crushed head, detail fracture, engine burn fracture, head-web separation, piped rail, horizontal split head, vertical split head, torch cut rail ends, torch cut bolt holes, and compound or transverse fissures.

The presence of any of these defects in the rail render that rail as scrap.

- b. Rail with wear limits greater than that specified above will be rejected. Relay jointed or CWR rail shall only have wear on one of the side of the head. Rail with wear on both sides of the head will be rejected.

xx. CONSTRUCTION REQUIREMENTS. Prior to beginning the work, the Contractor shall document to the Engineer that the railway company's authorized representative (Railroad Representative) has agreed as to the force to be employed and the speed with which the work shall proceed, and shall notify the Engineer and the Railroad Representative at least five working days in advance so that adequate arrangements can be made for the prosecution of the work.

The Contractor shall provide all tools and equipment needed in connection with this work.

The Railroad Representative may be supported by additional inspectors. The instructions of the Railroad Representative or inspectors regarding the quality and type of work to be done, upon approval by the Engineer, shall be complied with at all times by the Contractor.

The Contractor shall supply the necessary supervision and labor to prosecute the work properly and in such numbers as may be required by the Railroad Representative, and as approved by the Engineer.

At the request of the Railroad Representative, as approved by the Engineer, the Contractor shall remove any supervisor or employee not satisfactory to the railway company or the Engineer. The Contractor shall have a supervisor or foreman in charge of installation that is qualified to supervise certain track renewals as defined by FRA Track Safety Standards Section 213.7.

- (a) Ties. Remove sufficient ballast from cribs for adzing and anchor application. When necessary the ties must be adzed to get a full and even bearing for the tie plate. Excessive adzing must be avoided. The adzed surface shall be parallel to the top of the ties. As a tie renewal project has been completed in the area of the CWR installation, only limited adzing shall be required.

All spike holes shall be filled with chemical compound Sure Spike. All newly adzed surfaces shall be coated with an approved preservative. Spike stubs shall be driven as required.

Tie plates will be used under running rails on all tracks.

Tie plates should be free of dirt and foreign material when installed.

Care must be exercised to see that canted tie plates are applied so as to cant the rail inward.

Tie plates must be placed square with the rail and centered on the tie. Particular care must be given to see that the tie plate shoulders are never under the base of the rail and that the tie plates are well seated on the ties and the rail properly seated on the tie plate.

Ties shall be bored with a tie boring machine. Ties must be spiked with two rail-holding spikes on each rail and with additional rail-holding and plate-holding spikes as shown on the Plans.

All cut spikes shall be started and driven vertically and square with the rail and so driven as to allow 1/8 inch to 3/16 inch space between the underside of the head of the spike and the top of the base of the rail. In no case shall the spikes be overdriven, or straightened while being driven.

Spikes on gauge side of the running rail are to be placed across from each other and spikes on the field side of the running rail are to be placed across from each other. Spikes on the field side are to be placed in the hole on the north side to the plate. The pattern is to be held consistent.

- (b) Rails. Rail anchor pattern shall be spaced approximately uniformly along the rail length. To avoid tie skewing, the anchors must be applied against the same tie on opposite rails.

Rail anchors when applied must have full bearing against a sound tie.

Traffic shall not be permitted upon the newly installed rail section until the track has been accepted by the Railroad Representative and the Engineer.

- (c) Cleanup. The Contractor shall remove from the railway company's property all rubbish and waste from the work and dispose of it as directed by the Engineer. After completing the work, the Contractor shall remove from the railway company's property, and from all public and privately owned property, at the Contractor's expense, all temporary structures and waste resulting from the Contractor's operations.

The Contractor shall remove joint bar bolts, spikes, rail anchors, and any other rail holding devices in a workmanlike manner which does not damage any existing materials. Flame cutting of bolts to be removed will be permitted providing the joint bars and rails are not damaged.

- xx. INSTALLATION DETAILS. When unloading rail, do not drop it on uneven surfaces or leave it unevenly supported. Place the unloaded rail so it can be laid with as little handling as possible.

Lay rail to the correct gauge. In order to maintain correct gauge, at least every fourth tie must be gauged on tangents and every third tie on curves. Plug all spike holes properly. The gauge shall be 56½ inches, unless directed otherwise by the Railroad and the Engineer, between points 5/8 inch below the top of the rail on the two inside edges of the rail.

The use of a method to gauge track by gauging tie plates by drilling of the tie and use of gauge plugs to hold the tie plate shall be permitted.

(a) Rail Laying Procedures.

- (1) Apply joint bars before the track is spiked. The fishing surfaces of joints and bolt threads must be lubricated before the joint bars are applied.
- (2) Rail must be fully tie-plated and bolted.
- (3) Apply rail anchors immediately after rail is laid. All rail laid in a given day must be fully anchored on that same day.
- (4) Do not use a hammer, maul, or other similar tool to drive the rail into position. Instead, slide it into position with lining bars or lift it into place with rail tongs.
- (5) Do not select kinked, crooked, or surface-bent rails for laying in track.

Use a rail saw to cut any rail.

When making bolt holes in the field, all holes must be made with a rail drill.

When rail is being laid in territory equipped with track circuits, a Railroad Signals and Communications Representative will be present to ensure the proper operation of signal equipment. See SIGNALS AND COMMUNICATION of this Section for additional details. Rail joints shall be applied so that bars are not cocked between the base and head of rail. Bars are to be properly seated in rail.

Tighten bolts to the required torque, starting with the two bolts in the middle of the bar and working towards the ends. Strike both bars with a sledge hammer during the tightening process to help seat the bars properly. Do a final re-tightening of the two middle bolts. Torque bolts as required by AREMA for the respective bolt size. All bolts shall be torqued with a mechanical bolt machine and set to apply the required torque. Do not strike insulated joint bars in this manner.

Tamp all ties on which the newly laid rail does not have a full bearing. Use a mechanical tamper. Ties shall be tamped after rail is bolted and laid in tie plates and prior to gauging and spiking. No raising of track will be required or allowed.

For installation of compromise joints, space track ties under compromise bars at 18 inch centers with a tie directly under the rail end of the lighter of the two rail sections being joined. It is required that good hardwood ties be maintained under compromise joints. When using temporary compromise joints as part of rail change-out or turnout change-out programs, it is permissible to use track shims to support the joint until the shims and compromise joints are removed the next day. Tamp the ties to support any permanent compromise joints left in the track. Do not use shims to support permanent compromise joints.

After rail installation operations are completed, the ballast shall be "dressed" manually or by machine to restore the original ballast section. There shall be no ballast material left on the base of the rails, tie plates, or top of the ties. Switches and other appliances shall be dressed and swept and cribs dressed so that the ballast does not interfere with the motion of the switch, switch point derail, and/or derail.

When necessary to make a temporary connection for the passage of a train, the union shall be made with a rail of the section being renewed. The closure rail shall not be less than 14 feet long, and shall be connected to the new rail by a compromise joint if the rails are of different sections. The connection rail shall have a full number of bolts and spikes. At the completion of a day's work, a short section of new rail not less than 18 feet long shall be used in making the closure and shall be connected to the old rail with a compromise joint.

- (b) Mismatched Rail Joints. The rail match at any joint must be that any dimension of one rail must match the corresponding dimension of the other rail, to a tolerance of 1/8 inch. This applies anywhere within the area of possible wheel contact.

The rail mismatch must be measured once standard or compromise joints have been applied and tightened. If mismatched rail ends have already been battered (the larger rail has been struck by wheels), the amount of battering must be taken into account when calculating the mismatch.

If the rail mismatch is more than the 1/8 inch tolerance, the mismatch will be corrected by grinding the higher rail to match. The length of ramp required for this procedure is calculated as the ramp slope, which must not be more than .010 inch per inch of length.

- (c) Temperature Requirements. CWR should be laid within the preferred rail laying temperature (PRLT) range as specified in AREMA Manual, Current Edition: Part 5 Section 5.2.4 Laying Procedure for Continuous Welded Rail (CWR) on Existing Track.

Laying and adjusting procedures for CWR are dependent on the maximum and minimum rail temperatures expected.

If CWR is laid at temperatures above the maximum rail laying temperature, the CWR must be adjusted prior to November 30th of year installed.

If CWR is laid at air temperatures below the minimum preferred rail laying temperature, rail heaters will be used to bring rail temperature within range of PRLT.

The rail temperature of any CWR string laid must be measured with an accurate thermometer placed on the base of the rail near the web. The thermometer designed for measurement of rail temperature must be away from the wind and out of direct sunlight.

- (d) Rail Expansion. CWR rails must be laid without expansion gaps.

To lay CWR which is below the minimum preferred rail laying temperature, the rail must be heated to the preferred laying temperature with a propane rail heater. The rail heater is operated directly behind the rail-laying crane or rail vibrator.

The temperature of the rail determines the amount of heat required.

On the base of the rail next to a secure tie plate which has been gauged, mark the exact distance the rail must expand based on the difference between the rail temperature and the PRLT. This should be done at each quarter point and the end.

To ensure proper rail movement occurs, the rail must be vibrated by a mechanical vibrator.

Do not under any circumstances use spike mauls, sledge hammers, or other types of hammers or tools to vibrate the rail by striking it.

Equipment such as hydraulic rail pullers may also be used to expand the rail to the proper PRLT equivalent length.

- (e) Use of Anchors. Rail anchors must be applied immediately after CWR is laid. All rails laid in a day must be fully anchored before the end of the day.

Trains must not be allowed to pass over the unanchored CWR except in an emergency. Then, they must not go faster than five miles per hour.

Use following procedures when anchoring CWR:

- (1) For the first and last 200 feet of each string, including connections as noted on the Plans, apply and box rail anchors at every tie in both directions, including where joints are to be thermite welded. For the remainder of the string, apply and box anchors at every second tie for restraint in both directions.
- (2) Where CWR joins conventional jointed rail, all rail, except those supporting the rail joint, should be box anchored for 200 feet in each direction.
- (3) If joints have been eliminated by thermite welding, it is permissible to remove anchors on every second tie.
- (4) For welded rail over 90 feet long but less than 400 feet long, apply and box rail anchors at every tie in both directions.
- (5) Where continuous welded strings are connected to jointed rails, apply and box anchors at every third tie on the jointed rail.
- (6) Where CWR connects to bolted rail, anchor the first six bolted rails at every third tie in both directions.
- (7) Through turnouts and other special trackwork connected to CWR, anchor rails in accordance with the following;
 - a. Every tie in each track of the turnout shall be box anchored wherever possible, i.e. when anchors are applied to one rail, anchors are also required on the opposite rail of the same track. Rail anchors should be applied on the gauge side of the rail except where insufficient clearance restricts the use of the anchor or application tool, in which case anchors may be applied from the field side of the rail where clearance permits.
 - b. In addition to the mainline, the diverging track shall be anchored a sufficient distance to prevent rail movement from disturbing the switch point and frog.

- c. Every cross tie shall be box anchored for 200 feet ahead of the head block and 200 feet behind the frog on each track on each side of the turnout.

A minimum 12 foot stagger should be maintained between welds and bolted joints.

Every tie must be box anchored for a distance of at least 300 feet back from the abutment at either end of bridges.

Bolted joints, including temporary jointed, in connecting strings of continuous welded rail must not be located on bridges.

Also, they must not be located on roadbed approaches within 300 feet of the ballast walls at either end of the bridge.

A record of all CWR strings laid must be maintained and given to the Engineer. The record must indicate the date, the string number, the weight of the rail, the manufacturer, the year, the temperature at which the rail was laid, the mileage location, and whether the string was north or south rail. Each rail string shall be marked with a permanent method that identifies each rail. Markings shall be on each end of the rail. The method of marking rails shall be submitted to the Engineer for approval.

xx. REMOVAL AND DISPOSITION OF MATERIALS.

(a) Stacking of Rails.

- (1) Rails shall be stacked on approved sills a minimum of 6 inches above the ground.
- (2) Rails shall be stacked with the heads up and with the ends even.
- (3) Each layer shall be separated by at least three (3) 2 inch X 4 inch wood strips evenly spaced along the length of the rail.
- (4) Rail shall be grouped by weight, section, drilling, condition, length, and amount of wear.
- (5) The weight, section, drilling, and length shall be marked on one (1) of the rails near the mid-height of the stack.
- (6) These markings shall be painted neatly near one (1) end of the rail.

(b) Stacking of Joint Bars, Gauge Rods, and Tie Plates.

- (1) Joint bars, gauge rods, and tie plates shall be sorted by section, punching, and condition and shall be stacked on pallets.
- (2) Each pallet stack shall be steel banded for forklift handling.

- (3) The maximum weight on any pallet shall be 1,500 pounds.
- (4) Compromise joint bars shall be wired together in pairs and stacked on pallets, separate from other bars.

(c) Containers.

- (1) Rail anchors shall be sorted by type and size and placed in kegs, steel drums, or other approved containers.
- (2) Containers shall be labeled with the rail weight and section.

(d) Material to be Scrapped. All used spikes, nuts, bolts, and washers shall be scrapped and shall become the property of the Contractor and shall be removed from the project site.

xx. OPERATIONS AND REQUIREMENTS OF CONTRACTOR SUPERVISION. The work shall be supervised at all times by a Contractor superintendent and a foreman in charge of field operations who are well experienced in track construction and fully qualified to direct and supervise the installation of ballasted trackwork on railroad systems.

xx. METHOD OF MEASUREMENT. The quantities of Special Provision (Continuous Welded Rail) to be measured for payment will be the number of meters (linear feet) of rail (measured as track feet) installed in the complete and accepted work.

xx. BASIS OF PAYMENT. The accepted quantities of Special Provision (Continuous Welded Rail) will be paid for at the Contract unit price per meter (linear foot). Payment will be full compensation for removing existing rails; furnishing and installing new continuous welded rail (CWR); inventorying, transporting, and stockpiling salvaged rail and Other Track Materials (OTM); scrapping of non-salvaged track materials; de-stressing rail as required; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.640 Special Provision (Continuous Welded Rail)	Meter (Linear Foot)