# BALLASTED TURNOUTS

**From St. Albans STP 2038(14)

xx. DESCRIPTION. This work shall consist of furnishing and installing insulated and non-insulated ballasted turnouts, and performing work incidental to these special trackwork installations, including but not limited to removing existing turnouts; inventorying, transporting, and stockpiling salvaged turnouts and other track materials (OTM); scrapping of non-salvaged materials; and removing and disposing of existing switch ties, at the locations indicated in the Plans and as directed by the Engineer.

xx. GENERAL REQUIREMENTS. Except as otherwise required in the Contract Documents, trackwork construction and material shall comply with the following:

(1) American Railway Engineering and Maintenance Association (AREMA) "Manual for Railway Engineering," Published Annually.

(2) AREMA "Portfolio of Trackwork Plans" Published Annually.

(3) 16’-6” straight split switches shall conform to AREMA Plan No. 111 (Latest Version). Samson Switch Point according to AREMA Plan No. 221 detail 5100 shall be used.

(4) Turnout and crossover data shall conform to AREMA Plan No. 910 (Latest Version).

(5) Bills of switch ties shall conform to AREMA Plan No. 912 (Latest Version). All ties shall be supplied in even foot lengths. Non-even foot lengths shown in the tables shall be rounded up to the next even foot length.

(6) Details for switch points shall conform to AREMA Plan No. 221 (Latest Version). Use Detail 6100 for switch points.

(7) Switch rod and clip details shall conform to AREMA Plan No. 222 (Latest Version). Use side jaw clip for hand thrown operation. Use insulated switch head rod with basket adjustment for insulated turnouts.

(8) Switch plates and adjustable rail braces shall conform to AREMA Plan No. 224 (Latest Version).

(9) Rail Bound manganese steel frogs shall conform to AREMA Plan No. 613 (Latest Version).

xx. SUBMITTAL REQUIREMENTS. Inventory of salvaged materials shall be submitted to the Engineer for review and approval.

The following information shall be submitted to the Engineer prior to ordering switch ties:

(1) Name of the tie manufacturer, and name(s) and location(s) of the sawmill, seasoning yard, and treatment plant.

(2) Description of manufacturer's equipment, type, age, and present condition. Particular attention shall be made concerning equipment used to artificially season ties, if proposed. Gauges and thermometers on seasoning and treatment equipment shall have been calibrated within six months of the date of seasoning and treatment.

(3) Wood species proposed and the quantities of each. Fabrication Drawings of all tie layouts showing appropriate dimensions and spacing of timber switch ties.

(4) Product data for ties to be furnished.

(5) Contracts with suppliers and carriers who will be involved in the furnishing of ties. Such contracts shall include applicable requirements of this Contract.

(6) Copy of timber tie fabrication plant's Quality Control Program not less than 30 days before the start of preservation treatment.

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 and joint bar 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, drilling, typical rail length, date rolled, and the name of the mill where the rail was rolled. The design of the joint bars and compromise joint bars proposed to be furnished with each rail section shall also be provided.

(2) Certificates of Compliance. The Contractor shall submit Manufacturer's Data and Certificates of Compliance for the following materials:

a. Joint Bars

b. Compromise Joint Bars (as required)

(3) A rail handling plan for the unloading and installation of all rail and turnout material for review and approval by the Engineer.

(4) Fabrication Drawings of all joint bars and compromise bars to be furnished to the Engineer for review and approval.

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 material 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 and joint bars proposed for use in this project. The Contractor shall bear all expenses incurred for this inspection.

(b) Switch Ties. All switch ties shall be new. Timber switch ties, other than headblock ties and machine ties, shall be 7 inch x 9 inch grade and shall be of the lengths indicated on approved Fabrication Drawings submitted by the Contractor and approved by the Engineer.

The Contractor shall determine the quantities of timber switch ties required and submit Fabrication Drawings for review and approval by the Engineer. Show the location and length of timber switch ties on the Fabrication Drawings for the various turnouts included in the Contract. Coordinate switch tie length selection to ensure that no tie is spiked within 14 inches of either end. Provide switch ties in 12 inch increments only.

Except as hereinafter provided, all switch ties shall be free from any defects that may impair their strength or durability as ties, such as decay, large splits, large shakes, large or numerous holes or knots, or grain with slant greater than 1 in 15.

A switch tie is not well manufactured when its surfaces are cut into with score marks more than 1/2 inch deep and will be rejected.

The top and bottom of a switch tie will be considered parallel if any differences in the thickness at the side or ends does not exceed 1/2 inch.

All thickness, width, and face dimensions apply to the rail bearing area. All determinations of width will be made on the top of the switch tie, which is the narrower of the two horizontal surfaces.

(1) Acceptable Wood Species. Switch ties shall be oak. Water oak is not acceptable. Hardwoods other than oak listed in the "Specifications for Timber Ties" of the AREMA Manual, Chapter 3, Part 2, may be allowed if approved by the Engineer.

(2) Seasoning. Timber switch ties shall be well seasoned. Timber ties manufactured from red or white oak shall be dried to an oven dry moisture content of 50 percent or less prior to preservative treatment. The wood may be air dried, vapor dried, or boultenized. Submittals shall indicate the type of seasoning to be utilized.

Ties which are to be dried by artificial means shall be seasoned and treated as soon as possible after sawing, but in no case more than 30 days later.

The temperature used for boultenizing shall be as high as possible, but in no case less than 200°F.

Vapor dried ties shall be transferred from drying cylinders to treatment cylinders as quickly as possible to avoid loss of heat from the seasoned ties.

(3) Sawing. Ties shall be sawn on top, bottom, and sides. Tie surfaces shall not vary more than 1 inch from a straight line: 1) when measured along top of tie from the middle of one end to the middle of the other end, and 2) when measured along the side of tie from the middle of one end to the middle of the other end.

(4) Incising. Timber ties shall be incised on all four sides in the pattern specified in the AREMA Manual for Railway Engineering, Chapter 3, Part 6, "Wood Preserving."

(5) Machining. Machining operations shall be performed prior to preservative treatment.

Prior to the installation of gang nail type anti-splitting devices, a kerf shall be cut on the top surface of tie. The top surface shall be the wider face of the tie which is furthest from the heartwood.

(6) Preservative Treatment. Timber cross ties and switch ties shall be pressure treated in accordance with Chapter 3, Part 6 "Wood Preserving" of the AREMA Manual by the empty cell process with a 60/40 creosote/coal tar solution (Grade C) to a minimum retention of 8 pounds per cubic foot of wood. The Contractor shall record treatment as specified in the current AWPA Standard M-2 "Standard for Inspection of Treated Timber Products."

(7) Anti-Splitting Devices. Timber ties utilized in turnouts shall be equipped with anti-splitting devices of the type indicated below regardless of whether or not the wood has shown any tendency to split. Products used shall conform to the AREMA "Specifications for Devices to Control the Splitting of Wood Ties."

Timber switch ties shall be equipped with steel dowels or approved gang nail plates. Dowels shall be of the four-fluted type and be a minimum of 6 inches in length. Each switch tie shall be equipped with four dowels. Each dowel shall be located 4 inches from the end of the tie and 2 inches from the top or bottom surface of the tie.

The gang nails shall be galvanized in accordance with AREMA Specifications.

The gang nails shall be installed by mechanical equipment capable of pressing the tie together, closing all splits before application.

Splits in timber cross ties and switch ties shall be closed before treatment by selectively applying anti-splitting devices of the type shown on the Plans. Products used shall conform to the AREMA "Specifications for Devices to Control the Splitting of Wood Ties."

(c) Rail.

(1) General. All rail used in special trackwork shall be as shown on the AREMA plans referenced on the Plans. New turnouts built in ballasted track shall be constructed of new heat treated 115 RE rail.

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

(2) End Condition. Rail fishing in the joint bar area shall match the appropriate rail section.

Any necessary bolt holes shall be drilled.

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.

(d) Joint Bars. Rails shall be cut to lengths as indicated on the Plans and according to AREMA specifications.

New joint bars (short toe bars), six-hole, 36 inch joint bars shall be used for permanent or temporary joints in new running rails. Joint bars shall be of the size, shape, and punching pattern to fit the rail being joined. Joint bars shall conform to the requirements of "Specifications for High-Carbon Steel Joint Bars" or "Specifications for Quenched Carbon-Steel Joint Bars and Forged Compromise Joint Bars" specified in Chapter 4, Part 3 of the AREMA “Manual for Railway Engineering.” Joints in turnouts may be jointed or insulated as indicated on the Plans.

Compromise joint bars shall be new and of the size, shape, and punching pattern to fit the rail sizes and sections being joined. Compromise joint bars shall conform to the requirements of "Specifications For Quenched Carbon-Steel Joint Bars and Forged Compromise Joint Bars" found in Chapter 4, Part 3 of the AREMA “Manual For Railway Engineering.” Only factory designed and produced (forged or cast) six-hole compromise joint bars shall be used to join rails of different sizes and/or sections. Compromise bars shall be manufactured to take into account the wear of the adjoining rails.

(e) Other Track Materials. Track Lock Spikes, Screw Spikes, and Spikes shall be new and conform to the requirements of the AREMA Manual Chapter 5, Part 2 "Specifications for High Carbon Steel Track Spikes" with the dimensions specified in "Design of Cut Track Spike".

Standard cut spikes for use with 7 inch Grade ties and all switch timber shall be 6 inches by 5/8 inch.

Contactor may propose the use of lock or screw spikes in accordance with the following:

(1) Lock spikes shall be 5/8 inch x 7 inches and be manufactured of alloy spring steel with a minimum tensile strength of 160,000 psi with an elongation of 2.5%.

(2) Screw spikes shall be forged from medium carbon steel as per ASTM A 66 and be 7/8 inch diameter and 7 inches long.

Bolts, nuts, and spring washers shall be new and shall conform to the dimensions and specifications given in "Design for Track Bolts and Nuts", "Rail Drilling, Bar Punching and Track Bolts" and "Specifications for Heat Treated Carbon Steel Track Bolts and Carbon Steel Nuts", all as specified in Chapter 4, Part 3 of the AREMA Manual. Track bolts shall have oval necks.

Spring washers shall be new, 1/16 inch larger than nominal size of track bolt and shall conform to dimensions and specifications given in "Specifications for Spring Washers" in Chapter 4, Part 3 of the AREMA Manual. A spring washer will be used with each track bolt.

Track bolt assemblies shall be new and sized by the Contractor to fit joint bar assemblies and rail drillings.

Tie plates shall be new and made from low carbon steel. Tie plates shall conform to Chapter 5, Part 1 of the AREMA Manual. In general, plates should be at least 7 ½ inches X 14 inches, AREMA Plan No. 8 with B-6 punching.

Rail anchors shall be new. Sizes shall conform to the various sizes of rail on the project and conform to "Specifications for Rail Anchors" in Chapter 5, Part 7 of the AREMA Manual.

(f) General. Frogs, switches, guardrails and turnout appurtenances shall be new for all turnouts. All materials used in all new turnouts shall be of the same weight and similar section and in conformance with the Contract Documents.

Each major component shall be tin tagged with the corresponding turnout number.

Switch stands shall be hand throw, non run-through type. Switch handles shall be of ergonomic design. Connecting rods shall be included with switch stands.

Switch banners shall be target type red/green reflective.

Ballast shall conform to the requirements of RAILROAD BALLAST of Section 900.

xx. CONSTRUCTION REQUIREMENTS.

(a) Removal, Salvage, and Disposition of Materials. The Contactor shall remove existing turnouts as indicated on the Plans.

All turnout materials with the exception of used spikes, nuts, bolts, washers, and switch ties shall be salvaged for later use by the Railroad.

(b) Inventory of Track Materials. The Contractor shall keep a detailed inventory of excess and salvaged track materials stockpiled for the Railroad. A detailed inventory shall be recorded and submitted to the Engineer in an appropriate format acceptable to the Engineer. Payment under this Section will be contingent upon the Engineer's acceptance of the inventory.

(c) Stacking of Special Trackwork Materials. Special trackwork materials shall be palletized and stacked as directed by the Engineer. The rail weight, rail section, and length shall be marked on each switch point. The weight, section, and frog number shall be marked on the side of each frog casting. Other switch materials salvaged shall be placed in steel drums and labeled as to rail weight, section, length of points, and turnout size.

(d) Material to be Scrapped. 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. Switch ties from the existing turnouts shall be removed and legally disposed of in accordance with all applicable laws and regulations. All scrapped material shall be removed from the project site prior to final inspection.

(e) Quality Control.

(1) Switch Ties. Timber switch ties shall be manufactured and treated in accordance with the "Specifications for Crossties of the Railway Tie Association," the "Specifications for Switch ties of the Railway Tie Association," and Chapter 3 of the AREMA "Manual for Railway Engineering," except as modified herein.

The Contractor shall obtain the services of an independent tie inspection service (Service) to perform inspections that will assure compliance with the Contract, in accordance with the following:

a. Require switch tie supplier to provide suitable facilities, equipment, and assistance necessary for the Service's inspector to work efficiently.

b. Perform an initial inspection of each tie prior to seasoning.

c. Ties shall be judged independently without regard to decisions made on other ties in the same lot. Ties too muddied for ready examination shall be rejected.

d. Examine top, bottom, sides, and ends of each tie in accordance with AREMA Specification for Timber Crossties, Article 1.1.5 - Inspection. Ties handled by hoist shall be turned over for inspection.

e. Ties accepted for seasoning shall be subject to additional inspections by the Service at any time and at any stage of preparation for treatment.

f. Review with the supplier the type and amount of preservative used in treatment of the ties.

g. Service shall examine and pass judgment on the adequacy of each piece of equipment used during any step of the manufacture and treatment of the ties.

h. Service shall examine records of preservatives used and treatment of the ties and shall not approve ties for shipment until such records indicate that the ties are in compliance with the requirements of this Section.

The Engineer may elect to perform additional inspections of the ties at any time. Final acceptance of ties will occur only at the time of delivery and acceptance of the panelized special trackwork in which the ties will be incorporated.
Timber cross ties and switch ties shall be carefully handled to avoid damage in accordance with the AREMA Specification “The Handling of Ties from the Tree into the Track.”

Establish handling requirements in writing with carriers involved in the transportation of ties. The type or types of handling equipment and tie downs which will be allowed shall be detailed in the purchase orders for ties.

Seasoning and treatment of switch ties shall be in accordance with the AREMA Manual, Chapter 3, Part 6, "Wood Preserving." Provide the Engineer with 14 days written notice of the date(s) scheduled for artificial seasoning and treatment of ties.

Submit a timber and steel layout plan for all special trackwork a minimum of thirty calendar days prior to commencement of work. The timber layout plan shall eliminate all weave ties and indicate the lengths, spacings, and locations of new timber. In addition it will show the lengths of all rails and locations of all field welds, bolted joints, and insulated joints. The Contractor's steel layout diagram for all special trackwork will clearly show the dimensions and type of all components to be utilized in each turnout.

Turnout installation includes all turnouts and special trackwork which is to be constructed in place at locations as indicated on the Plans.

Special trackwork and turnouts shall be constructed at the locations indicated on the Plans. Dimensions, details, and configuration of the turnout shall be according to AREMA specifications or as otherwise shown on the Plans. Switch ties shall be placed according to AREMA specifications or as otherwise shown on the Plans. In no case shall the end of a switch tie be within 14 inches of a spike, lock spike, or screw spike.

Submit a timber plan for approval to the Engineer which shows the proposed timber plan to the frog area and long timbers from frog to switch point on all turnouts.

(2) Other Track Material. The dimensions and general arrangement of all other track materials shall conform to the AREMA Manual.

Load, unload, and stack OTM in a manner to prevent loss or damage to the materials. Any OTM damaged or lost will be replaced and paid for by the Contractor at no expense to the Agency.

The Engineer may examine any materials furnished by the Contractor for defects, damage, or non-conformance prior to installation. Materials not meeting the requirements of these provisions or that are determined to be damaged or defective shall be removed from the project site and shall be replaced by acceptable materials at no additional cost to the Agency.
OTM shall be delivered in approved containers (kegs) or on pallets.

OTM shall be handled by methods that will not result in damage or loss.

(f) General. All turnout components such as switch points/stock rails, restraining rails, rail joints, and frog castings shall fit properly and be of the proper match. Both rail ends at all rail joints throughout the turnout and at the joints at the frog shall be matched on both the top (tread portion) and on the gauge side of the rail. Rail end welding and grinding and slotting shall be performed to achieve a good match. After assembling turnouts, all bolted joints will be slotted per AREMA Standard Plan.

All special trackwork shall be assembled within 0.15 feet of theoretical alignment prior to ballasting work. A layer of bottom ballast shall be placed over the subballast and compacted with a vibratory roller in lifts of not more than 4 inches. The final elevation of the compacted ballast layers shall be not more than 2 inches below the final bottom elevation of the switch timber. Then the timber and steel special trackwork components shall be placed on the compacted ballast and built before final surfacing and alignment of trackwork. Care shall be taken during turnout construction and placement to minimize disturbance to the ballast and subballast.

Make initial and final surfacing and alignment passes. The final surfacing and alignment lift for the turnout shall not exceed 2 inches and shall be accomplished with a vibratory switch tamper. Tamping, ballast dressing requirements, and alignment tolerances shall be as indicated in BALLASTED TRACK CONSTRUCTION FOR TURNOUTS AND GRADE CROSSINGS of Section 900. Ballast level in cribs beneath the connecting rod, switch point rails, and switch rods shall be 2 inches below any turnout steel or as directed by the Engineer.

Switch machines and targets shall be installed and the switch operating mechanisms adjusted so that the switch operates smoothly, without excessive force being required. All switch plates and connection points in the switch rod shall be lubricated with graphite based lubricant. All cotter pins shall be installed in upright and connecting rod bolts as well as at the appropriate heel block bolts.

All turnouts shall be solid box anchored to include, where possible, 300 feet in all directions beyond the turnout to include both the straight and turnout sides.

xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Ballasted Turnouts) of the type specified to be measured for payment will be the number of turnouts placed in the complete and accepted work.

xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Ballasted Turnouts) of the type specified will be paid for at the Contract unit price per each. Payment will be full compensation for furnishing, transporting, handling, and placing the materials specified; removing, inventorying, transporting, and stockpiling salvaged turnouts and OTM; scrapping of non-salvaged materials; removing and disposing of existing switch ties; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Partial payments will be made as follows:

75% of the Contract unit price will be paid upon accepted installation of the turnout.

The remaining 25% of the Contract unit price will be paid upon acceptance of the inventory of salvaged material by the Engineer, the transport and stockpiling of salvaged material, and the disposal of ties.

Payment will be made under:

| Pay Item | | Pay Unit |
|---|---|---|
| 900.620 | Special Provision (Ballasted Turnouts, Insulated) | Each |
| 900.620 | Special Provision (Ballasted Turnouts, Non-Insulated) | Each |