

VII. MATERIALS

7.01 SUBBALLAST

Subballast shall be crusher-run stone (dense graded aggregate), preferably limestone or granite material and shall meet the requirements as set out in Chapter 1, Part 2, Article 2.11, "Specifications for Subballast" of the American Railway Engineering and Maintenance-of-Way Association (AREMA) manual.

Gradation as follows:

Sieve Size	2"	1"	3/8"	No. 10	No. 40	No. 200
% Passing Size (optimum)	100	95	67	38	21	7
Permissible Range % Passing	100	90-100	50-84	26-50	12-30	0-10

Subballast shall be spread on a graded roadbed as a base, with sufficient width to accommodate the desired number of tracks (see Plans Nos. 1-21 and 1-22, attached to these guidelines.) The subballast shall be compacted to 95 percent of its maximum dry density and have a minimum depth of 6 inches. (For 6 inches of compacted subballast on a single industry track roadbed as per Plan No. 1-22, use approximately 0.83 ton per foot of track.)

7.02 BALLAST

Material for ballast used on industry tracks shall be clean crushed stone with a minimum depth of 9 inches for lead tracks and 6 inches for spur tracks between bottom of crosstie and top of subballast (see Plan Nos. 1-21 and 1-22 attached to these guidelines). Cribs (spacing between the crossties) shall be filled with ballast to the top of the ties.

Stone for use as ballast on tracks, or portions of tracks, to be owned by the Railway Company, shall be furnished by a Company approved quarry and shall be crushed stone (granite) conforming to the requirements of NS Specification No. 702.

If approved by the Railway's Chief Engineer, limestone ballast conforming to Specification No. 702 may be used on tracks not owned by the railroad Company. Limestone ballast should comply with Norfolk Southern Specification No. 702. However, if material meeting the Company specification is not available, limestone ballast proposed to be used on tracks not owned by the Company will comply with AREMA specifications.

#3 Ballast (Modified) will be used under all main tracks, lead tracks, and switching tracks parallel to a main track on the Company side of the division of ownership and maintenance (See Plan No. 1-21 attached).

Yard tracks (including turnouts), spur tracks, switching tracks where a #3 modified ballast is not required, and runaround tracks may use either a #3 (modified) or #5 ballast.

Gradation shall conform to the following table:

Sieve Designation	Sieve Opening	#3 Ballast (Modified) %Passing Sieve	#5 Ballast % Passing Sieve
2 ½"	2.5"	100	-
2"	2"	95-100	-
1 ½"	1.5"	30-65	100
1"	1"	0-15	90-100
¾"	0.75"	-	40-75
½"	0.5"	0-5	15-35
3/8"	0.375"	-	0-15
No. 4	0.187"	-	0-5
No. 200	0.0029"	0.5 Max	0.5 Max

7.03 RAIL

Rail shall be new or relay of good quality, with minimum section of 100 pounds/yard. Relay rail should be free from local bends, kinks, battered ends, excessive engine burns and surface corrugations.

Rail should be furnished in lengths not less than 31 feet and should be drilled to accept the proper size joint bars for the section of rail being used.

Based on planned track usage and/or tonnage a heavier rail section (continuous welded rail) should be considered. If welded rail is used, the type of welding should have approval of the Company's Chief Engineer or his representative.

Rails should be laid one at a time. The bottom of the rail and the bearing surface of the tie plate should be cleaned of all debris before the rail is laid. Joints in opposite rails shall be staggered not less than 8 feet and not more than 14 feet apart, except as close joints may be required at insulated joints or turnouts. To minimize the cutting of full length rails, short rails of not less than 15 feet may be used in adjusting for proper spacing of joints. Proper allowance for expansion should be provided at rail joints by installing rail expansion shims conforming to the section of rail being used.

When necessary to cut and/or drill a rail, it should be cut with an approved rail saw, and drilled with an approved rail drill. Flame cutting of rail will not be permitted.

7.04 TURNOUTS

Turnouts shall be new or relay of good quality of the same or greater rail section as the parent track. The turnouts shall be the size and shape as called for on the plans and shall meet all requirements in accordance with an approved design, AREMA, or equal. The turnout material shall be complete in every respect to construct the needed turnouts ready to receive train traffic. Package switches shall be of an approved design, AREMA, or equal, equipped with standard reinforced points and of correct length for the size of turnout of which they are a part. Frogs shall be of an appropriate design, AREMA or

equal, equipped with plates of the proper size and type to fit the designed track layout. All frogs will be No. 10 or larger (**See 4.07**). Frogs shall be of the same or heavier rail section as that of the parent track. Where the Company has plans to upgrade the parent track, then the rail and frog section shall be as required by the Railway Company. Reference Standard Plan No. 2-17 for turnout geometry. Turnouts to be used in tracks to be owned by the Railway Company shall conform to the Company's standard turnout plans, not AREMA turnout plans.

7.05 CROSSTIES

Crossties should be new and conform to Norfolk Southern specification R&T 5/91 for 6" x 8" x 8' 6" - Grade 3, 7" x 8" x 8' 6" - Grade 4, or 7" x 9" x 8' 6" - Grade 5 for oak and mixed hardwood ties. All ties shall be air dried to a maximum of 50% moisture content for oak and 40% for mixed hardwoods before treatment.

The ties must be sterilized during treatment by holding them in 190°-210° F temperature creosote for at least six hours. This time shall not include creosote filling or emptying, nor temperature adjustments or final vacuum time. Final retentions shall be 8#/CF in oak and 10#/CF for mixed hardwoods. Except as noted above, all treatment shall be governed by American Wood-Preservers' Association Standards C1, C6, M1, M3, and M4. A 60/49 creosote-coal tar solution conforming to AWWA Standard P-2 shall be used. The solution shall be tested according to AWWA Standard A-1.

Crossties to be used in tracks to be owned by the Railway Company shall be purchased from a Norfolk Southern approved crosstie supplier. Certification of the ties must be furnished from the contractor and/or supplier based on Norfolk Southern specifications.

Crossties shall be placed on the prepared subballast at right angles or normal to the centerline of the track. Crossties shall be spaced 20 inches, center to center (60 ties per 100 feet) with the ends of the ties along one side of the centerline on tangent track and along the inside on curved track being placed 1' 10 ¾" from the gage of the nearest rail.

The Industry should be aware that lead and switching tracks (or similar) to be owned and/or maintained by the Company may require the use of steel ties. Specifications and design details for this application are beyond the scope of these guidelines. Per the **INTRODUCTION**, if the use of steel ties is a consideration, the Company's Chief Engineer or his representative must be contacted for further direction.

7.06 SWITCH TIES

Switch ties shall be new oak and mixed hardwood ties of 7" x 9" in cross section and in 12" length increments as required for the turnout being used. All switch ties shall be air-dried and treated as called for in Article 6.05 "Crossties." No second hand switch ties may be used.

Switch ties to be used in turnouts to be owned by the Railway Company shall be purchased from a Norfolk Southern approved switch tie supplier. Certification of the ties must be furnished from the contractor and/or supplier based on Norfolk Southern specifications.

Switch ties shall be placed on finished subballast and spaced according to the Standard Plan for the turnout being used.

7.07 TIE PLATES

Tie plates should be new or second hand, of good quality and of an approved design for the weight of rail to be used. Two tie plates per tie, under the base of rail, must be used. Also, tie plates must be used on all switch ties not protected by switch plates, frog plates, or guard rail plates.

The tie plates shall be double shouldered and have a minimum size of 7 ½" x 11" with proper punching to fit the base of the rail being used. The down slope (1:40 cant) of the tie plate shall be directly over and parallel with the centerline of the crosstie. The tie plate shall be set so that the outside shoulder of the tie plate shall bear squarely against the base of the rail, having a full bearing for the rail and at the same time, a full bearing on the crosstie.

7.08 RAIL JOINTS

Joints should be either new or second hand, of good quality and of the size, drilling, and hole spacing to fit the rail being used.

Joint bars should be properly installed with the full number of and the correct size of bolts, nuts and spring washers. Bolts shall be placed with nuts alternately on inside and outside of rail and shall be drawn tight before spiking. Bolts shall be tightened by the use of approved track wrenches or track bolt machines.

All joints should be kept out of grade crossings.

When different size rails are to be connected, forged compromise joints shall be used. The above mentioned recommendation for rail joints should apply to compromise joints.

Any field fabrication of compromise joints will be strictly prohibited, that is, the cutting down of larger standard joints to fit smaller rail will not be allowed.

7.09 BOLTS AND NUTS

Bolts and nuts for the track and turnouts should be new or approved relay and of the correct diameter and length to fit the rail and joints being used. Bolts and nuts must conform to the latest AREMA specifications.

7.10 LOCK WASHERS

Lock washers should be new and of correct diameter to fit the bolts being used. Each track bolt should be equipped with a spring lock washer, conforming to the most current AREMA Specifications for Spring Washers.

7.11 RAIL ANCHORS (JOINTED RAIL)

Rail anchors should be new or relay of good quality and should be the correct size and of approved design for the rail used. Anchors should be applied so as to box anchor every fourth tie, i.e., the number of anchors shall be equal to the number of ties. Rail anchors should be installed through the turnouts in accordance with the Standard Plan for the turnout being used. Rail anchors to be used on tracks to be owned by the Railway Company shall conform to Norfolk Southern specifications and be purchased from a Norfolk Southern approved supplier.

7.12 TRACK SPIKES

Only standard, new 5/8" x 6" track spikes should be used and should conform to the most current AREMA Specifications for Low Carbon Steel Track Spikes. A minimum of two spikes per tie plate is required on tangent track. Spikes through the turnout should be applied in the number and location required in accordance with the Standard Plan attached for the turnout(s) being used. Track spikes to be used on tracks to be owned by the Railway Company shall conform to Norfolk Southern specifications and be purchased from a Norfolk Southern approved supplier.

The spiking pattern for curves should be in accordance with the anchor and double spiking of curves diagram (see attachment Plan 7-3A).

7.13 DRIVE SCREW SPIKES

New 7/8" x 7" drive screw spikes should be used for turnouts in accordance with the Standard Plan for the turnout(s) being used.

New drive screw spikes of appropriate size shall be used for grade crossings in accordance with Plan 7-05, Plan 7-05A, 7-05B and Plan 1-3 attached to these guidelines.

7.14 DERAILS

Derails should be new or approved relay and must be the type indicated on the approved plans at the new designated location. Where double switch point derails are required they must be installed in accordance with the attached Standard Plan for Derails. Derails other than double switch point derails shall be Hayes Sliding Derail, Model HB or approved equal. They must be sized to fit the rail and thrown with an operating stand. Operating stands must be furnished with targets. Care must be taken when installing derails to insure that they are installed in the proper direction to derail cars away from the main track.

7.15 EARTH MOUNDS AND BUMPING POSTS

Earth Mounds are the Company's first choice for end of track (EOT) devices. Earth Mounds or Bumping Posts shall be placed at the open end of all stub-ended tracks.

Earth Mounds (see attached Detail: Earth Mounds) should be of an approved design sufficient to stop a moving car and should be protected against erosion.

Where factors exist to exclude Earth Mounds, bumping posts may be constructed. Bumping posts shall be either new or second-hand, of good quality and approved design. Bumping posts may be used on stub end tracks which end at a structure or dock within a paved roadway, or where public or private safety is required.

The Industry must provide 30 feet or one half car length (whichever is greater) of vacant space between the last car spot and the beginning of the EOT device for safety.

7.16 SWITCH POINT PROTECTORS

Depending on amount of traffic through turnouts and/or location of turnouts, switch point protectors should be installed. Where needed, these protectors should be new or second-hand, of good quality and should be compatible with the size and type of switch point being used. The design for switch point protectors to be used on turnouts to be owned by the Railway Company shall be approved by Norfolk Southern.

7.17 FROG GUARD RAILS

Guard rails must be installed for all frogs except self guarded frogs. They should be new or second-hand, of good quality, of an approved design, AREMA or equal and equipped with proper plates.

7.18 SWITCH STANDS

Switch stands must be installed for each turnout. Norfolk Southern strongly recommends using a New Century Model 51-A switch stand equipped with an ergonomic bow handled throwing lever by G&B Specialties, Inc. (see attached Detail: Bow Handled Throwing Lever). All switch stands should be complete in every respect and throw rods adjusted for proper throw, including grinding of stock rails if such is necessary for positive closure of switch point against stock rail.

Switch stands and latches shall be securely fastened to head block ties using 5/8" bolts, or standard cut spikes as specified by the Company. Switch stand cranks must be made of forged steel.