

**TIMBER CROSS TIES AND SWITCH TIES**

This specification covers the requirements of Canadian National Railways for the production of wood ties.

**INDEX**

<b><u>Section</u></b>	<b><u>Subject</u></b>	<b><u>Page</u></b>
1	SCOPE	2
2	MANUFACTURE	2
3	SPECIES	2
4	PHYSICAL REQUIREMENTS	2
4.1	GRADE	2
4.2	LENGTH	3
4.3	STRAIGHTNESS	3
4.4	PARALLEL SIDES	3
4.5	TWIST	4
4.6	END SQUARENESS	4
5	INSPECTION	4
5.1	DECAY	4
5.2	HOLES	4
5.3	KNOTS	4
5.4	BARK SEAMS	4
5.5	SLOPE OF GRAIN	4
5.6	WANE	4
5.7	SHAKE	4
5.8	CHECKS	4
5.9	SPLITS	5
6	PROCESSING	5
6.1	BORING	5
6.2	INCISING	5
6.3	IDENTIFICATION	6
6.4	AIR SEASONING	6
6.5	END PLATING	6
7	PRESERVATIVE TREATMENT	6
8	DEFINITIONS	7
9	QUALITY ASSURANCE	8
10	RETURN OF SHIPMENT	9

**CANADIAN NATIONAL RAILWAYS**  
**12—30 B**  
**TIMBER CROSS TIES AND SWITCH TIES**

Supersedes CN  
Specification 12-30A

**1 Scope**

This specification covers hardwood and softwood timber cross ties and hardwood switch ties; both untreated and treated.

**GENERAL REQUIREMENTS**

**2 Manufacture**

- 2.1 All ties shall be sawn from live timber.
- 2.2 Ties shall be sawn on all four sides and hardwood ties shall have boxed heart at both ends.
- 2.3 Ties presented for inspection shall be sufficiently free from ice, snow, mud, etc. to allow for complete visual inspection.

**DETAILED REQUIREMENTS**

**3 Species**

- 3.1 Cross ties shall be one of the following wood species and shall be as specified on the purchase order (e.g. mixed hardwoods, oak, softwood):

**Hardwoods**

Beech	Gums	Sassafras
Birches	Hickories	Sycamore
Cherries	Maples	Walnuts
Elm	Oaks	

**N.B. Oaks shall not include Water or Overcup Oaks.**

**Softwoods**

Douglas Fir	Ponderosa Pine	Western Hemlock
Jack Pine	Scotch Pine	Western Larch
Lodgepole Pine	Southern Yellow Pine	

Other species may be accepted subject to the prior approval of the Chief Engineer of Track.


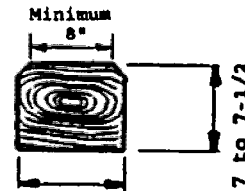
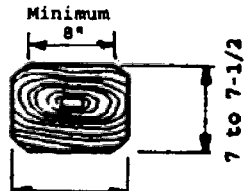
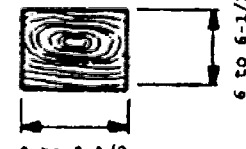
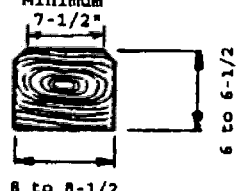
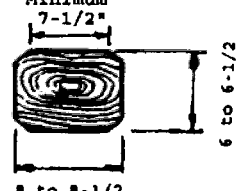
- 3.2 Switch ties shall be Oak, Black Gum (Tupelo) and/or Hard Maple.

**4 Physical Requirements**

4.1 Grade

4.1.1 Cross Ties

The cross dimensions of green, unseasoned cross ties shall be as shown below.

GRADE	TIE DIMENSIONS		
1	 <p style="text-align: center;">7 to 7-1/2 9 to 9-1/2</p>	 <p style="text-align: center;">Minimum 8" 7 to 7-1/2 9 to 9-1/2</p>	 <p style="text-align: center;">Minimum 8" 7 to 7-1/2 9 to 9-1/2</p>
2	 <p style="text-align: center;">6 to 6-1/2 8 to 8-1/2</p>	 <p style="text-align: center;">Minimum 7-1/2" 6 to 6-1/2 8 to 8-1/2</p>	 <p style="text-align: center;">Minimum 7-1/2" 6 to 6-1/2 8 to 8-1/2</p>

**FIGURE 1**

**4.1.2 Switch Ties**

All switch ties shall be sawn 7" to 7-1/2" by 9" to 9-1/2" nominal size, and have a minimum 8" face both top and bottom throughout the rail bearing area.

**4.1.3 Air Seasoned and Treated Ties**

Air seasoned and treated ties are allowed to be 1/4" under the above minimum dimensions.

**4.2 Lengths**

**4.2.1 Cross Ties**

Cross ties shall be 8', 8'6" or 9' long, with a plus tolerance of 1", as shown on the purchase order.

**4.2.2 Switch Ties**

Switch ties shall be in even foot lengths, with a plus tolerance of 2", as shown on the purchase order.

**Note:** Ties ordered as crossing ties are to be 9' or 9'6" long, with a plus tolerance of 1/2", as shown on the purchase order.

**4.3 Straightness**

A tie will be considered straight when a straight line from a point on one end to a corresponding point on the other end is no more than 1" difference from the surface at all points for every 8' in length.

**4.4 Parallel Sides**

Ties will not be accepted if any two sides are out of parallel by more than 1/8".

**CANADIAN NATIONAL RAILWAYS**  
**12—30 B**  
**TIMBER CROSS TIES AND SWITCH TIES**

Supersedes CN  
Specification 12-30A

4.5 Twist  
Ties will not be accepted if the twist of the tie exceeds 3/4" in any 8' of length.

4.6 End Squareness  
Ties will not be accepted with ends that are not flat or with end slope of more than 1/2".

**5 Inspection**

5.1 Decay  
Ties with decay will not be accepted. Blue stain is not to be considered decay.

5.2 Holes  
Ties will not be accepted with a hole over:

- Rail bearing area 1/2" in diameter and 3" deep
- Outside rail bearing area 1/4 of the width and 3" deep
- Numerous small holes equaling the above

5.3 Knots  
Ties will not be accepted with a knot over 1/3 of the width of the surface.

5.4 Bark Seams  
Ties will not be accepted with a bark seam more than 2" below the surface, 1/4" in width and/or 10" long.

5.5 Slope of Grain  
Ties will not be accepted with slope of grain over 1 in 15.

5.6 Wane  
Ties will not be accepted with wane in the rail bearing area in excess of that shown in Figure 1.

5.7 Shake  
Ties will not be accepted with shake covering more than 1/3 of the width of the ties, or within 1" of any surface.

5.8 Checks

5.8.1 Seasoned ties will not be accepted with checks deeper than 1/4 of the thickness and longer than 1/2 the length of the tie.

5.8.2 Seasoned softwood ties will be accepted with checks less than 1/4 of the thickness and shorter than 1/2 the length of the tie.

5.8.3 Seasoned hardwood ties with checks less than 1/8" in width and/or 10" in length are acceptable as is.

5.8.4 Seasoned hardwood ties with end checks intermediate between the two above conditions shall have nail plates applied to both ends.

**CANADIAN NATIONAL RAILWAYS**  
**12-30 B**  
**TIMBER CROSS TIES AND SWITCH TIES**

Supersedes CN  
Specification 12-30A

5.9 Splits

5.9.1 Unseasoned Ties

- a) Ties will not be accepted with splits in excess of 1/8" wide and/or 4" long.
- b) Hardwood ties with lesser splits are acceptable only if nail plates are applied to both ends.

5.9.2 Seasoned or Treated Ties

- a) Ties will not be accepted with vertical or diagonal splits in excess of 3/8" wide and/or 8" long or horizontal splits greater than 1/8" wide or 4" long.
- b) Softwood ties will be accepted with vertical or diagonal splits less than 3/4" wide and/or 8" long or horizontal splits less than 1/8" wide or 4" long.
- c) Hardwood ties with splits less than 1/4" wide and/or longer than the width of the face across which it occurs are acceptable as is. Splits not exceeding 10" long will be allowed if satisfactorily stabilized with a nail plate as described in Article 6.5.
- d) Hardwood ties with vertical or diagonal end splits less than 3/8" wide and/or 8" long but greater than 1/8" wide or 4" long are acceptable if nail plates are applied to both ends.

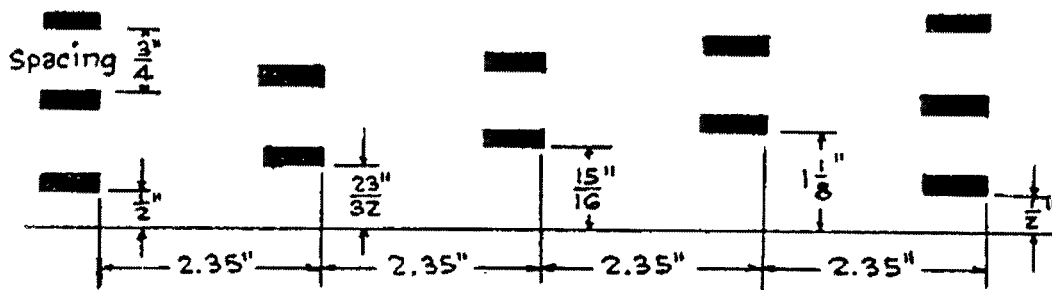
**6 Processing**

6.1 Boring

Ties are not to be bored, unless boring is specifically requested on the purchase order.

6.2 Incising

6.2.1 All ties shall be incised, before air seasoning, on four sides in accordance with the pattern shown below. (Patterns slightly different are not objectionable). The incisions shall be 3/4" deep with teeth not more than 7/32" thick.



Incising Pattern

6.2.2 This pattern produces a nominal 17 incisions in any 6" x 6" area and each tie shall have a minimum of 14 incisions in any 6" x 6" area of the sides.

**CANADIAN NATIONAL RAILWAYS**  
**12—30 B**  
**TIMBER CROSS TIES AND SWITCH TIES**

Supersedes CN  
Specification 12-30A

6.3 Air Seasoning

- 6.3.1 Moisture determination shall be made on a representative sample of each lot ready for seasoned inspection. Moisture determination and allowable moisture contents shall be in accordance with Chapter 30, Section 3.6.3.a of the American Railway Engineering and Maintenance Of Way Association Manual for Railway Engineering (AREMA)
- 6.3.2 All stacks of seasoning ties shall be supported on treated or non— decaying sills, and the first layer shall be off the ground 12” or more. Space between rows of stacks shall be not less than 3 feet.
- 6.3.3 Cross ties shall be stacked using the “German” ricking method.
- 6.3.4 In stacks of switch ties there shall be at least 2” of space between the layers and 1” between ties. Layer strips should be treated wood or other non-decaying material.

6.4 End Plating

- 6.4.1 Selected hardwood ties (see Sections 5.8 and 5.9) shall be end plated by squeezing the tie ends and pressing on a nail plate. With split ties the split shall be fully closed before plating.
- 6.4.2 The nail plates shall be 6” x 7” for 7” x 9” ties and 5” x 6” for 6” x 8” ties. The plates shall be at least 18 gauge galvanized steel with four to five 9/16” teeth per sq. in. The steel sheet shall be to ASTM A446, Grade C, coated to ASTM A525, Designation G60 (0.60 oz/ft<sup>2</sup>).

6.5 Branding

- 6.5.1 Branding of ends or the top or bottom surfaces of the ties as they pass through the machine shall be done with letters, figures, or symbols to indicate the following:
- Year
  - Company
  - Identification of plant
- Information can be included in the nail plating.
- 6.5.2 The height of letters and figures shall be 1-1/2”. Dies used for branding shall have cutting edges 1/8” wide which shall be indent the wood at least ¼” deep.

**7 Preservative Treatment**

- 7.1 Ties shall be treated in accordance with the latest edition of American Railway Engineering and Maintenance of Way Association (AREMA), Chapter 30 Section 3.6 "Wood Preserving".

Cross ties and switch ties designated as “High Density” ties, those ties destined for installation sites within the "Deterioration Zones" identified as zones 4 & 5 in AWPA C4 "Poles", shall receive the following treatment in lieu of that outlined in AREMA:

**Zone 4 & 5**

Red Oak	7.0 lb./cu.ft. Preservative solution P2
Gum & mixed hardwoods	9.2 lb./cu.ft. Preservative solution P2

**CANADIAN NATIONAL RAILWAYS**  
**12—30 B**  
**TIMBER CROSS TIES AND SWITCH TIES**

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Specification 12-30A

**Zone 4**

White Oak

7.0 lb./cu.ft. Preservation solution P2

If treatment to 7 lb/cu ft cannot be achieved , white oak shall be treated till refusal.

- 7.1.1 In addition to P2 treatment, zone 5 “High Density” ties also must be treated with a minimum retention of 0.11 lb/cu ft of DOT (Disodium Octaborate Tetrahydrate) or 0.111 lb/cu ft of Boron as B<sub>2</sub>O<sub>3</sub>.
  - 7.1.2 White oak can also be used in “deterioration zones” 1, 2, 3, & 4. Under no circumstances can White Oak be used in zone 5.
  - 7.1.3 Ties being installed in deterioration zones 1, 2, & 3 shall be treated with preservation solution P3.
- 7.2 The Boulton drying process can only be used with the prior approval of the Chief Engineer of Track.
- 7.3 AREMA Chapter 30, Section 3.6.3.a is to be considered as guideline in determining whether wood is dry enough to treat. The railway however ultimately reserves the right to specify acceptable moisture content for any hardwood or softwood specie before treatment.

**8 Definitions**

8.1 Bark Seam

A bark seam or pocket is a patch of bark partially or wholly enclosed in the wood.

8.2 Boxed Heart

A tie with boxed heart is one in which the pith is located no closer than 1” to any surface.

8.3 Check

A check is a separation of the wood due to seasoning, which appears on one surface only.

8.4 Shake

A shake is a separation along the grain, most of which occurs between the rings of annual growth.

8.5 Split

A split is a separation of the wood extending from one surface to the opposite or adjacent surface. Do not count the end as a surface.

8.6 Rail Bearing Area

8.6.1 Cross ties

The section of the tie between 20” and 40” from the centre of the tie.

8.6.2 Switch Ties

The section of the tie any more than 12” from either end of the tie.

**9 Quality Assurance**

- 9.1 CN requires its suppliers to establish and maintain Quality Assurance systems such as but not limited to ISO 9002 or AAR-M1003.
- 9.2 It is the manufacturer’s responsibility to satisfy the Railway that the ties conform to this

**CANADIAN NATIONAL RAILWAYS**  
**12—30 B**  
**TIMBER CROSS TIES AND SWITCH TIES**

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specification. Quality control procedures shall follow, but not be limited to, following the procedures described in AWPA Standard M3, "Standard Quality Control Procedures for Wood Preservation Plants".

- 9.3 The Railway reserves the right to perform any of the tests set forth in this specification where such tests are deemed necessary to assure the ties conform to the prescribed requirements.
- 9.4 The Railway's representative shall have, during working hours, free entry to all parts of the plant used in the manufacture of ties ordered to this specification.

**10 Return of Shipment**

- 10.1 Ties that do not comply with this specification or ties which, notwithstanding tests, inspection or acceptance at any time or location, are found to contain deficiencies, will be subject to rejection and return to the supplier. The supplier shall be entitled to a joint inspection of the defective ties at the Railway's premises. The supplier shall assume the expenses of handling and transportation in both directions.