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SPECIFICATION FOR PURCHASE OF WOOD CROSSTIES & SWITCH TIES

1. Overview

1.1 The purpose of this specification is to define the requirements for the purchase of treated and untreated crossties and switch ties for use by Amtrak and to ensure that all wood crossties and switch ties supplied to Amtrak are produced in accordance with the highest industry standards.

1.2 Wood crossties and switch ties must be purchased from an approved/qualified facility.

1.3 Specifications covering material and assembly will meet:

- Amtrak MW 1000
- AREMA, (American Railway Engineering & Maintenance-Of-Way Association)
- American Wood Preserver's Association Standards

In the event that there is a conflict between specifications, the most restrictive will apply.

1.4 Any ties or timber rejected will not be paid for and becomes property of supplier and must be disposed of by supplier at his expense. The supplier will also bear the expense of transporting to the inspection site, those ties which are subsequently rejected. Payment will be based on Amtrak inspection.

1.5 Both the Air-drying and the Boulton drying methods are approved by Amtrak.

1.6 Ties shipped by truck from manufacturer to Amtrak will be banded not to exceed 20 ties/ timber per bundle. Metal banding for bundles will be a minimum of 1 ¼" in width for ties up to 12' in length with 2 bands per bundle. Timber 13' and longer will be banded using 3 metal bands with a minimum width of 1 ¼". Banding will be minimum .025" in thickness.

1.7 Place and manner of delivery to be as agreed between supplier and

Amtrak. Upon delivery all ties/ timber will have clean surfaces.

- 1.8 Ties stored at plants after treating for later shipment shall be stacked tightly in piles, either separately or in bundles for easier handling.
- 1.9 Periodic performance reviews and audits of suppliers may be conducted by Amtrak representatives to ensure compliance with Specifications and Inspection.
- 1.10 Amtrak reserves the right to selectively inspect any or all orders of wood crossties and switch ties on an as needed basis. These inspections will encompass the specifications and tolerances outlined in this procedure and will be used as the basis to accept and reject wood crossties and switch ties for purchase.
- 1.11 This Specification consists of the following individual Specifications to form a complete purchasing document.
 2. Specifications for Unseasoned Crossties
 3. Specifications for Unseasoned Switch Ties
 4. Specification for Boulton Drying and Treatment of Crossties and Switch Ties
 5. Specification for the Air Drying and Treatment of Crossties and Switch Ties
 6. Borate Dual Treatment

2. **Specifications for Unseasoned Crossties**

2.1 Material

The following kinds of wood are acceptable for manufacturing crossties:

- Ashes
- Beech
- Birches
- Cherries
- Elms
- Gums
- Hackberries
- Hickories
- Locusts
- Hard Maples
- Mulberries
- Oaks
- Sassafras
- Walnuts

A minimum of 80% oak and a maximum of 20% mixed hardwoods will be accepted. Swamp oak is not permitted.

2.2 Physical Requirements

2.2.1 General Quality

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

2.2.2 Dimensions

2.2.2.1. All ties shall be 8'-6".

2.2.2.2. Except as hereinafter provided, crossties shall measure as follows throughout the rail bearing areas. The rail bearing areas as used here and hereafter are defined as those sections of the tie between 20" and 40" from its middle:

Size 5 - 7" x 9", minimum 8" faces.

Size 4 - 7" x 8", minimum 8" faces.

Size 3 - 6" x 8", minimum 7³/₄" faces.

2.2.2.3. Main track ties sizes 4 and 5: 75% minimum will be size 5. Size 4 and 5 ties may be loaded mixed in same car. Side Track ties size 3 must be loaded in separate cars.

2.3. Manufacture

2.3.1 Except as hereinafter provided, all ties shall be straight, well manufactured, cut square at the end, have bottom and top parallel, and have bark entirely removed.

2.4. Inspection

2.4.1 Crossties will be inspected at the location designated in Amtrak purchase order.

2.4.2 Inspectors will make a reasonable close examination of the top, bottom, sides and ends of each tie. Each crosstie will be judged independently, without regard for the decisions on others in the same lot.

2.5.

Tolerances

2.5.1. Decay is not allowed. "Blue stain" is a non-destructive surface fungus not decay, and is permissible in any wood.

2.5.2. Holes

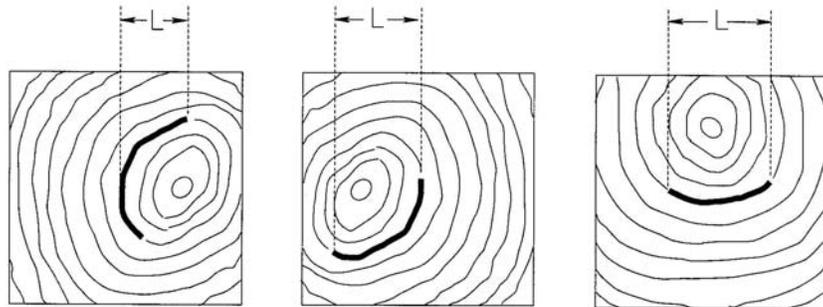
Within the rail bearing areas a large hole is one more than $\frac{1}{2}$ " in diameter and 3" deep. Outside the rail bearing areas a large hole is one having a diameter more than $\frac{1}{4}$ the width of the surface on which it appears and a depth of more than 3". Numerous holes are any number equaling a large hole in damaging effect. Such holes may be caused in manufacture or otherwise.

2.5.3. Knots

Within the rail bearing areas a large tight knot is one having an average diameter more than $\frac{1}{4}$ the width of the surface on which it appears; but a knot will be allowed if it is located outside the rail bearing areas. Numerous knots are any number of smaller knots equaling a large knot in damaging effect.

2.5.4. Shakes

Shakes are allowable provided the largest dimension measuring length is not more than $\frac{1}{3}$ the width of the tie and provided they do not extend nearer than 1" to any surface. The procedure illustrated in diagrams shall be used in determining the length of shake.



2.5.5. Splits

A split is a separation of the wood extending from one surface to an opposite or adjacent surface. In unseasoned ties, a split no more than $\frac{1}{8}$ inch wide and/or 4 inches long is acceptable.

2.5.6. Wane

Wane is defined as bark or the lack of wood. Except as noted in 3.2.2.2 (within the rail bearing area dimensions) outside the rail bearings wane will be limited to $\frac{1}{2}$ the face width on the top or bottom of the tie.

2.6. Workmanship

- 2.6.1. A crosstie will be considered straight: (1) when a straight line along the top from the middle of one end to the middle of the other end is entirely within the cross tie; and (2) when a straight line along a side from the middle of one end to the middle of the other end is everywhere more than 2" from the top and the bottom of the cross ties.
- 2.6.2. A crosstie is not well manufactured when its surfaces are cut into with score marks more than $\frac{1}{2}$ " deep.
- 2.6.3. The top and bottom of the crosstie will be considered parallel if any difference in the thickness at the sides or ends does not exceed $\frac{1}{2}$ ".
- 2.6.4. For unseasoned crossties the thickness and widths specified are minimal. Ties over 1" thicker or wider than the specified size may be rejected. Ties over 2" longer or 1" shorter than 8'-6" may be rejected.
- 2.6.5. All thickness, width, and face dimensions apply to the rail bearing areas of the tie. All determinations of width will be made on top of the tie, which is the narrower of the horizontal surfaces, or the one with the narrower or no heartwood if both horizontal surfaces are of the same width.

3. Specifications for Unseasoned Switch Ties

3.1. Material

- 3.1.1. All switch ties to be 100% oak, red or white. Swamp oak is not permitted.

3.2. Physical Requirements

3.2.1. General Quality

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

3.2.2. Dimensions

All switch ties shall be of the following dimensions: 7" x 9", 8" to 9" faces - lengths as ordered.

Face requirement shall apply only within the rail bearing areas, which is defined as the sections between 12" from each end of the switch tie.

3.3. Manufacture

3.3.1. Except as hereinafter provided, all switch ties shall be straight, well manufactured, cut square at the ends, have bottom and top parallel, and have bark entirely removed.

3.4. Inspection

3.4.1. Switch ties will be inspected at the location designated in Amtrak purchase order.

3.4.2. Inspectors will make a reasonable close examination of the top, bottom, sides and ends of each switch tie. Each tie will be judged independently without regard for the decisions on others in the same lot.

3.5. Tolerances

3.5.1. Decay

Decay is not allowed. "Blue stain" is a non-destructive surface fungus not decay, and is permissible in any wood.

3.5.2. Holes

Within the rail bearing areas a large hole is one more than $\frac{1}{2}$ " in diameter and 3" deep. Numerous holes are any number equaling a large hole in damaging effect. Such holes may be caused in manufacture or otherwise.

3.5.3. Knots

Within the rail bearing areas a large tight knot is one having an average diameter more than $\frac{1}{4}$ the width of the surface on which it appears. Numerous knots are any number equaling a large knot in damaging effect.

3.5.4. Shakes

Allowable provided largest dimension measuring length is not than $\frac{1}{3}$ of width of the tie and they do not extend nearer than 1" to any surface. The procedure illustrated in diagrams shall be used in determining the length of a shake.



3.5.5. Splits

A split is a separation of the wood extending from one surface to an opposite or adjacent surface. In unseasoned switch ties, a split no more than $\frac{1}{8}$ " wide and/or 4" long is acceptable.

3.5.6. Wane

Wane is defined as bark or the lack of wood. Except as noted in 3.2.2.2 (within the rail bearing area dimensions) outside the rail bearings wane will be limited to $\frac{1}{2}$ the face width on the top or bottom of the tie.

3.6. Workmanship

3.6.1. A switch tie will be considered straight: (1) when a straight line along the top from the middle of one end to the middle of the other end is entirely within the tie; and (2) when a straight line along a side from the middle of one end to the middle of the other end is everywhere more than 2" from the top and the bottom of the tie.

3.6.2. A switch tie is not well manufactured when its surfaces are cut into with score marks more than $\frac{1}{2}$ " deep.

3.6.3. The top and bottom of a switch tie will be considered parallel if any difference in the thickness at the side or ends does not exceed $\frac{1}{2}$ ".

3.6.4. For unseasoned switch ties the thickness and widths specified are minimal excepting wane allowance. Switch ties over 1" thicker or wider than the specified size may be rejected. Switch ties over 2" longer or 1" shorter than the specified length may be rejected.

3.6.5. 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 horizontal surfaces, or the

one with narrower or no heartwood if both horizontal surfaces are of the same width.

4. **Specification for the Air Drying and Treatment of Cross Ties & Switch Ties**

AWPA specifications for air drying and the treatment of air dried cross ties and switch timber, will apply.

- 4.1. User Commodity Specification U1-09 Section 6-C, Processing and Treatment Standard Section 8-C and Purchase Standard M1-08 of AWPA Book of Standards (latest revision) covering general requirements and air seasoning shall apply for conditioning of all ties under this specification.
- 4.2. Ties shall be incised on four sides prior to seasoning to check splitting and improve drying. Incisor teeth shall be no thicker than $\frac{7}{32}$ inch, shall penetrate $\frac{3}{4}$ inch and shall conform to industry standard pattern.
- 4.3. Crossties shall be branded by either hydraulic or air pressure with the letter AM to indicate ownership by Amtrak. The height of letters shall be $1\frac{1}{2}$ " enclosed in a circle. In addition, the treatment year date and supplier insignia will be branded on the opposite end. Dies used for branding shall have a cutting edge of $\frac{1}{8}$ wide, which shall indent the wood at least $\frac{1}{4}$ " deep.
- 4.4. Switch ties shall be branded in the same manner as cross ties, except that branding may be done manually.
- 4.5. Tie shall be treated with creosote - coal tar solution in accordance with AWPA standard P2 creosote solution.
- 4.6. Treating operations shall be in accordance with the AWPA (latest revision) by the empty cell process with initial air except as follows:

<u>Treatments</u>	<u>Oaks</u>	<u>Mixed Hardwood</u>
Initial Air (lbs.) Min	40	60
Pressure (lbs.) Max	205	205
Pressure (lbs.) Min	180	180
Temperature (°F) Max	210	210
Temperature (°F) Avg.	180	180
Vacuum (Sea Level) Min	22"	22"

- 4.7. All ties and timber should be treated to a minimum 7 lbs/cu-ft or to refusal.

4.8. Penetration Testing

- 4.8.1 With oak charges sample borings shall be from red oak only.
- 4.8.2 Borings will be 3.0 inches long.
- 4.8.3 Borings will be taken from the center of crossties and 1/3 length in from end of timber.
- 4.8.4 When possible 2-3 ties/ timber per tram load shall be tested

4.9. End Plates

- 4.9.1. End plates shall be used to close end splits. Split should be no longer than 3/8" X 5" and no horizontal splits. After application the end plates must be flush with the tie end and there must be no observed separation along the plane of split.
- 4.9.2. The end plates must be manufactured from material that has been treated for corrosion resistance, i.e. galvanized.
- 4.9.3. The end plates must be installed by mechanical equipment capable of pressing the tie together closing all splits before application.
- 4.9.4. End plate must cover 80% of tie end face, and must be place so as to cover the greatest area of splitting.
- 4.9.5. The end plate must include the following identification:
 - a. The letters AM.
 - b. The manufacturer's logo or initials
 - b. The year of manufacture (last two digits.)

4.10. Season Checks

Any ties or timber with season checks over 3/8" in width on any face or longer in length than 1/3 of the ties length should be rejected.

5. **Specification for Boulton Drying and Treatment of Cross Ties & Switch Ties**

(Used in conjunction with Amtrak Specifications for Unseasoned Ties)

- 5.1. AWPAs Standards (latest revision) covering general requirements and Boulton drying shall apply for conditioning of all ties under this specification. Maximum moisture contents shall be 50% for Boulton dried oak ties and 35% for other mixed hardwoods. Ties that have been seasoned for two months or more (timed from cutting) will not be Boulton dried.
- 5.2. Crossties will be branded, by either hydraulic or air pressure, with the letters AM to indicate ownership by Amtrak. The height of letter shall be 1 1/2" enclosed in a circle. In addition, the treatment year date and supplier insignia will be branded on the opposite end. Dies used for

branding shall have a cutting edge of 1/8" wide, which shall indent the wood at least 1/4" deep.

5.3. Switch ties shall be branded in the same manner as cross ties except that branding may be done manually.

5.4. Ties shall be treated with creosote - coal tar solution in accordance with AWWA standard P2 creosote solution.

5.5. Treating operations shall be in accordance with the AWWA by the empty cell process with air except as follows:

Treatments		Oaks	Mixed Hardwood
Initial Air (lbs.)	Min.	40	60
Pressure (lbs.)	Max.	205	205
Pressure (lbs.)	Min	180	180
Temperature (°F)	Max.	210	210
Temperature (°F)	Avg.	180	180
Vacuum (Sea Level)	Min	22"	22"

5.6. White oak should be treated to refusal and all others to 7 lbs./ cu-ft

5.7. Penetration Testing

5.7.1. With oak charges sample borings shall be from red oak only.

5.7.2. Borings will be 3.0 inches long.

5.7.3. Borings will be taken from the center of crossties and 1/3 length in from end of timber.

5.7.4. When possible 2-3 ties/ timber per tram load shall be tested

5.8. End Plates

5.8.1 100% of all ties and timber should be endplated before Boulton drying to check splits and gaps.

5.8.2. Splits should be no longer than 3/8" X 5" and no horizontal splits. After application the end plates must be flush with the tie end and there must be no observed separation along the plane of split

5.8.3. The end plates must be manufactured from material that has been treated for corrosion resistance, i.e. galvanized.

5.8.4. The end plates must be installed by mechanical equipment capable of pressing the tie together closing all splits before application.

5.8.5. End plate must cover 80% of tie end face, and must be place so as to cover the greatest area of splitting.

5.8.6. The end plate must include the following identification:

- a. The letters AM.
- b. The manufacturer's logo or initials
- c. The year of manufacture (last two digits.)

- 5.9. Season Checks
Any ties or timber with season checks over 3/8" in width on any face or longer in length than 1/3 of the ties length should be rejected.

6. **Specification for Borate Dual Treatment of Cross Ties & Switch Timber**

- 6.1 The Borate dual treatment may be specified for new ties and timber for New Orleans and Florida and other severe rot zone areas or station proximities where creosote odor can cause a problem.
- 6.2 Mixture of borate and creosote must be compatible with AWPA Standard Specifications.
- 6.2.1 Ties must obtain 6 pounds per cubic foot net retention creosote for oak and mixed hardwoods
- 6.2.2 Ties must meet minimum 0.111 pcf Boric Acid Equivalent (BAE) or .274 pcf Disodium Octaborate Tetrahydrate (DOT).

Joe Smak



Director of Engineering
Standards and Tests

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