METROLINX

Timber Tie Specification

Specification 34 11 33.2

Revision 00
September 2024

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Amendment Record

Amendment in Clause No.	Date of Amendment	Description of Changes
Rev 00	September 2024	Initial version established.

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Documents

Table 1: Supporting Documents

Document Number	Document Title	Relation
AAR M-1003	Quality Assurance Certification	Parent Standard
AREMA MRE Chapter 30 Part 3	Solid Sawn Timber Ties	Parent Standard
AWPA M2	Standard for the Inspection of Preservative Treated Products for Industrial Use	Parent Standard
AWPA M3	Standard for the Quality Control of Preservative Treated Products for Industrial Use	Parent Standard
AWPA M4	Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products	Parent Standard
ISO 9001	Quality Management Systems – Requirements	Parent Standard

All tests shall be carried out according to the latest revision of the standard test methods referred to in this Specification.

Acronyms and Abbreviations

Table 2: Acronyms and Abbreviations

Abbreviation	**Full Name**
AAR	The Association of American Railroads
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASTM	American Society for Testing and Materials
AWPA	American Wood Protection Association
EAM	Engineering and Asset Management
ISO	International Organization for Standardization
MRE	Manual for Railway Engineering

Definitions

Table 3: Definitions

Term	Definition	Source
Bark Seam	A bark seam or pocket is a patch of bark partially or wholly enclosed in the wood.	AREMA MRE Chapter 30
Boxed Heart	A tie with boxed heart is one in which the pith is located no closer than 1" to any surface.	
Check	A check is a separation of the wood due to seasoning, which appears on one surface only.	AREMA MRE Chapter 30
Shake	A shake is a separation along the grain, most of which occurs between the rings of annual growth.	AREMA MRE Chapter 30
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.	AREMA MRE Chapter 30
Rail Bearing Area (for Cross Ties)	The section of the tie between 20" and 40" from the centre of the tie.	AREMA MRE Chapter 30
Rail Bearing Area (for Switch Ties)	The section of the tie any more than 12" from either end of the tie.	AREMA MRE Chapter 30
Twist	A twist is a rotation of the ends (or a rotation between two cross-sections) of the wood around the axis created between two centres of the ends.	
Wane	Wane is defined as the lack of wood.	AREMA MRE Chapter 30

1. General Requirements

1.1. Types of Ties

1.1.1. Grade 1 Cross Ties shall be 7 in x 9 in (178 mm x 229 mm) in cross section and 8 ft. 6 in (2591 mm) in length. These ties are for use primarily on main track.

1.1.2. Turnout Ties are for the installation in turnouts as per the lengths outlined on the appropriate GTS plans.

1.1.3. Transition Ties shall be 9 ft. (2.7 m), 10 ft. (3.1 m), or 11 ft. (3.4 m) in length, which are appropriate for the use between different track structures with changes in track modulus (e.g., bridges, crossings, turnouts, and between different tie types such as steel and concrete).

1.1.4. Crossing Ties shall be 9 ft. (2.7 m) or 10 ft. (3.1 m) in length, which are appropriate for the use within and beyond road crossings.

2. Detailed Requirements

2.1. Manufacturing

2.1.1. All ties shall be sawn from live timber.

2.1.2. Ties shall be sawn on all four sides and shall have Boxed Heart at both ends.

2.2. Species

2.2.1. Permitted hardwood Cross Tie and Transition Tie species are Beech, Yellow Birch, Cherries, Gums, Hickories, Maples, Oaks, Sassafras, Sycamore, and Walnuts.

2.2.2. Switch Ties and Crossing Ties shall be Oak, Black Gum (Tupelo) and/or Hard Maple.

2.2.3. Softwood species are not permitted to be used for ties.

2.2.4. Other species may be permitted with written approval from Director, Engineering - Track.

2.3. Grade

2.3.1. The cross-sectional dimensions of unseasoned ties shall be as shown in in Figure 1 below. 1″ of Wane is allowed in the top face if the bottom of the tie is full face.

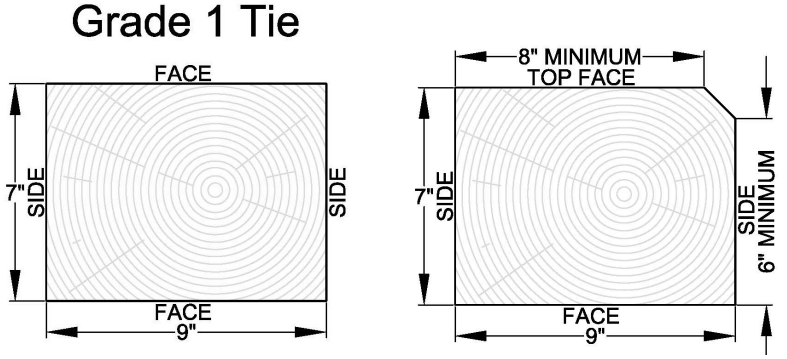

Figure 1: Tie Dimensions

2.3.2. Air Seasoned and Treated Ties: Air seasoned and treated ties are allowed to be 1/4″ under the above minimum dimensions.

2.4. Length

2.4.1. Cross Ties shall be 8 ft. 6 in. long with a plus tolerance of 1″.

2.4.2. Switch Ties shall be in round foot lengths, with a plus tolerance of 2″.

2.4.3. Transition Ties shall be 9′, 10′ or 11′ long, with a plus tolerance of 1″.

2.4.4. Crossing Ties shall be 9′ or 10′ long, with a plus tolerance of 1/2″.

2.4.5. Other lengths may be permitted with written approval from Director, Engineering - Track.

2.5. Straightness

2.5.1. Ties will be accepted when a straight line from 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.

2.6. Parallel Sides

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

2.7. Twist

2.7.1. Ties will not be accepted if the twist of the tie exceeds 3/4" in any 8' 6" of length.

2.8. End Squareness

2.8.1. For proper seating of nail plates, ties will not be accepted with ends that are not flat or with a sloped end of more than 1/2", which equals a 1 in 20 cant.

2.9. Inspection

2.9.1. Ties presented for inspection shall be sufficiently free from ice, snow, mud, etc., to allow for complete visual inspection.

2.9.2. Ties must be presented for inspection in an organized manner with all surfaces clean for ready observation. Inspectors will make a reasonably close examination of the top, bottom, sides and ends of each tie. Each tie will be judged independently, without regard to the decisions on others in the same lot.

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

2.9.4. Ties will not be accepted with a hole over:

a) 1/2" in diameter and 3" deep in the Rail Bearing Area;
b) 1/4 of the width and 3" deep outside Rail Bearing Area;
c) or numerous small holes equaling the above.

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

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

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

2.9.8. Wane: Ties will not be accepted in excess of that shown in Figure 1: Tie Dimensions.

2.9.9. Shake: The procedure shown in Figure 2 shall be used to determine the length of a Shake. Ties will not be accepted with any shake covering more than 1/3 of the width of the ties, or within 1" of any surface.

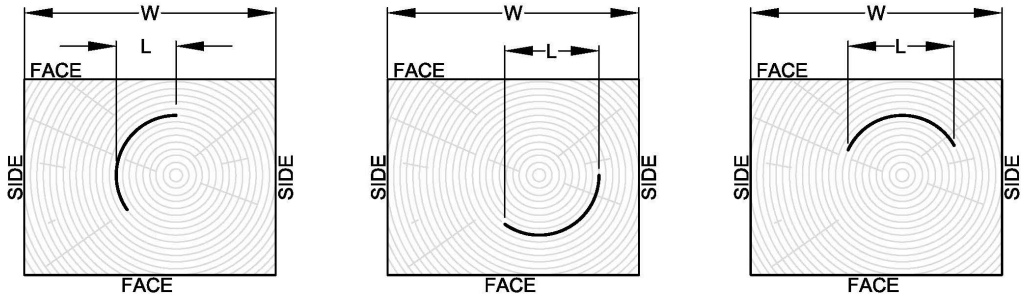

Figure 2: Shake Allowances

2.9.10. Checks:

a) 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.

2.9.11. Splits for Unseasoned Ties:

a) Ties will not be accepted with splits in excess of 1/8″ wide and/or 4″ long.

2.9.12. Splits for Seasoned 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.

2.10. Processing

2.10.1. Boring: Ties are not to be bored, unless boring is specifically requested by Metrolinx.

2.10.2. Incising:

a) All ties shall be incised, before air seasoning, on four sides in accordance with the pattern shown below. The incisions shall be 3/4″ deep with teeth not more than 7/32" thick.

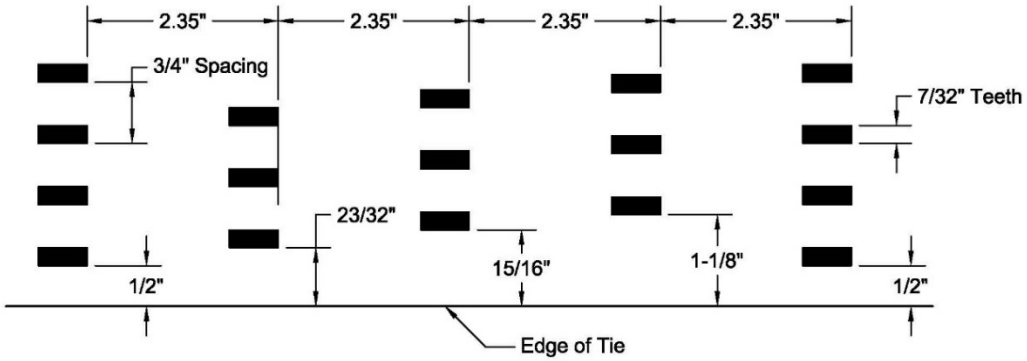

Figure 3: Incising Pattern

b) 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.

2.10.3. End Plating:

a) All ties shall be end plated with nail plates on both ends.

b) All ties shall be branded with letters, figures, or symbols on the nail plate to indicate: year, manufacturer, and identification of plant.

c) Nail plates shall be applied by a mechanical device capable of squeezing any splits together, bringing the tie back to its original dimensions, prior to application.

d) Nail plates shall be applied prior to or at the time the ties are delivered to the treating plant, prior to air-seasoning to maximize their effectiveness.

e) The nail plates shall be 6" x 7" for 7" x 9" ties and 5" x 6" for 6" x 8" ties.

f) The nail plates shall have four to five 9/16" teeth per square inch.

g) The steel sheet shall be made of 18-gauge galvanized sheet steel ASTM A653/A653M Structural Steel (SS) Grade 40 or better with a minimum coating designation of G60. ASTM A653/A653M SS Grade 40 G60 mechanical properties are as follows: Yield Strength - 40,000 psi minimum; Ultimate Tensile Strength - 55,000 psi minimum; and Elongation in 2 inches - 16% minimum.

2.10.4. Air Seasoning:

a) 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 AREMA Chapter 30, Section 3.6.3.a.

b) 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.

c) Cross ties shall be stacked using the "German" ricking method. This is accomplished by stacking cross ties in layers of 8 to 10 with one tie as a stringer at every other end. Timbers 5 inches or more thick should be stacked with at least 2 inches of air space between layers. Lumber less than 5 inches thick should be stacked with at least 1 inch between layers. Within each layer, all pieces should be at least 2 inches apart.

d) 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.

e) Details for moisture tests prior to treatment are found in AWPA Standard M2, Section 2. Metrolinx reserves the right to perform such a test to ensure proper conditioning before treatment.

2.11. Preservative Treatment

2.11.1. Ties shall be treated in accordance with the latest edition of AREMA, Chapter 30 Section 3.6 "Wood Preserving" and Section 3.7 “Specifications for Treatment”. Inspection for conformity to these requirements shall be as specified for the individual type of material or species as shown in the appropriate AWPA Standards and as specified in AREMA Chapter 30 Article 3.7.5.1, Article 3.7.5.2, and Article 3.7.5.3.

2.11.2. Creosote is the only acceptable preservative. Creosote must meet the requirements of AWPA P1/P13. Other preservatives may be used with written approval from Director, Engineering - Track.

2.11.3. The Boulton drying process can only be used with written approval from Director, Engineering - Track.

2.11.4. AREMA Chapter 30, Section 3.6.3.a is to be considered as guideline in determining whether wood is dry enough to treat. Metrolinx ultimately reserves the right to specify acceptable moisture content for any species before treatment.

3. Quality Assurance

3.1. Application

3.1.1. Material ordered to this Specification is subject to inspection by Metrolinx or its representative with respect to all the requirements of this Specification.

3.2. Manufacturing Facility Access

3.2.1. Metrolinx or inspectors representing Metrolinx shall have free entry, at all times while work on the contract of Metrolinx is being performed, to all parts of the manufacturer’s works which concern the manufacture of the material ordered. The manufacturer shall afford the inspectors, without charge, all reasonable facilities to satisfy them that the material is being supplied in accordance with this specification. Unless otherwise agreed, all inspections and tests shall be made at the place of manufacture prior to shipment and will be so conducted as to not interfere unnecessarily with the operation of the works.

3.3. Quality Assurance

3.3.1. AWPA Standard M2 outlines the authority and responsibility of the inspector employed by the railroad for the purpose of determining that material purchased by the railroad has been processed properly and that the resulting product will provide long service life.

3.3.2. Quality control procedures shall follow, but not be limited to, the procedures described in AWPA Standard M3. Treating plants shall be equipped with the thermometers and gauges necessary to indicate and record accurately the conditions at all stages of treatment, and all equipment shall be maintained in acceptable, proper working condition and meet the requirements of AWPA Standard M3. The apparatus and chemicals necessary for making the analyses and tests required by Metrolinx shall also be provided by plant operators and always kept in condition for use. Metrolinx is entitled to review the results of the periodic testing and/or retesting of instruments and gages to ensure they have an accuracy in accordance with this standard.

3.3.3. If it is necessary to cut into treated wood, the freshly cut surfaces shall be further protected by a thorough application of preservative to the freshly cut surface. AWPA Standard M4 shall be applied which provides further details on this scenario.

3.3.4. Supplier shall establish and maintain a Quality Assurance system such as ISO 9001 or AAR-M1003.

3.3.5. Supplier shall provide Quality Assurance and testing documentation to Metrolinx upon request.

3.4. Test Samples

3.4.1. Metrolinx 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.

3.5. Defective Material

3.5.1. Material not conforming to this specification is subject to rejection and return to the supplier. The supplier shall be entitled to a joint inspection of the defective ties at Metrolinx's premises. The producer shall stop further production until the fault has been corrected and shall dispose of all rejected material without cost to Metrolinx.