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(Specification Note: The purpose of this specification guide is to assist the designer in correctly specifying hardwood switch ties, cross ties and tie blocks. The designer needs to edit these guide specifications to fit the needs of each specific project. Contact a Tropical Forest Products representative to assist in appropriate product selections and specification editing.

Tropical Forest Products Switch Ties, Cross Ties and Tie Blocks

A.0. TIES - Naturally Durable Hardwood: to be **Iron Woods™**.

Ekki, Lophria Alata of the Ochraceae family.
Mora, Mora Excelsa of the Leguminosae family
Greenheart, Ocotea Rodiaei of the Lauraceae family
Garapa Apuleia Leiocarpa
Cumaru Dipterix Odorata
Angelim Vermelho / Angelim Pedra, Dinizia Excelsa of the Leguminosae family

Unless otherwise indicated, tropical hardwood switch ties, cross ties and tie blocks shall conform to all relevant requirements of current AREMA practice and recognized standards existing in countries where the timber is harvested and/or where the products are produced

A.1. Moisture Content:

A.1.1. Tropical hardwood switch ties, cross ties and tie blocks shall be seasoned by either air drying or kiln drying in accordance with the current American Wood Preserves Association (AWPA) Standard C6, except as indicated below:

- A. Cross ties and tie blocks shall be seasoned to achieve an average moisture content of less than 30 percent in the outer 1 inch layer of the top and bottom surfaces of the piece, and less than 40 percent in the core of the piece.
- B. After seasoning, the top and bottom surfaces of tie blocks, cross ties and timbers shall be finished to the required dimensions. "To finish to the required dimensions" means to produce flat and even surfaces of the specified dimensional tolerances, and free from any defects produced by the handling of the piece by mechanical device such as excess score marks, rough surface cuts, indentations or steps, grooves etc.
- C. No preservative treatment shall be required for tropical hardwood ties, tie blocks and timber.

A.2. Surface:

A.2.1. Option A: all lumber to be supplied S4S (surfaced four sides)

A.3. Dimension Tolerance :

A.3.1. Tropical hardwood switch tie, cross tie and tie block dimensions shall be as indicated on the Drawings or in the Bid Documents.

A.3.2. Unless otherwise indicated on the Drawings or in the Bid Documents, tropical hardwood switch tie, cross tie and tie block dimensions shall be well sawn and cut square at both ends. A tie or timber is not well sawn when its surfaces are cut into with score marks more than ¼ inch deep, or when its surfaces are not even. Tolerances will be subject to the following:

- A. A tolerance of plus ¼ inch or minus 1/8 inch in width.
- B. A tolerance of plus or minus 1/8 inch in thickness.
- C. A tolerance of plus 1 inch or minus ¼" in length.

A.4. Over length:

A.4.1. Option A: All lumber shall be supplied over the specified length, to allow for final trim and proper fit in the field.

A.5. End Coating:

A.5.1. All lumber is to be supplied with the ends sealed with "Anchorseal", Paraffin or approved wax end sealer. All lumber must be resealed after cutting to reduce end splits.

A.6. Environmental Compliance:

Specification Note: It must be recognized that the specification of FSC certified materials does not guarantee their availability. Vendors should be consulted before inclusion of FSC requirements into project specifications.

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Specification Note: A.6.1. should be included on all Non USGBC/LEED specifications.

Specification Note: A.6.1. and A.6.2. should both be included on all USGBC/LEED specifications.

A.6.1. Option A: “Comprehensive Environmental Specification Language”

All lumber shall meet minimum environmental requirements as defined under LEGAL LUMBER™ Controlled Wood, Chain of Custody, Life Cycle Impact and Due Care – Environmental Compliance Standards, Policies and Procedures confirming that:

All products have been third party verified of legal origin and compliance as being, legally harvested, transported, exported, imported and documented in compliance with all country of origin, international and domestic laws, rules, regulations and treaties pertaining to the fair and legal trade of forest products including but not limited to the U.S. Department of Agriculture Lacey Act which includes but is not limited to The U.S. Foreign Corrupt Practices Act, U.S. Forced Labor Laws, U.S. Buy American Act , ITTA (International Tropical Timber Trade Agreement) and CITES (Convention On The International Trade of Endangered Species).

All products are derived from forests which are naturally occurring, renewable and sustainable and are not harvested from forests or forest plantations where traditional or civil rights have been violated, forests having high conservation values which are threatened, forests that have been genetically modified or forests which have been converted to non-forest use. All products and their packaging materials have been kiln dried and or fumigated and are free from live and or invasive insect, plant or animal species.

All products are 100% organic and grown without the use of chemical fertilization and are regenerated naturally or by seeding and replanting. The natural service life of the products trap and store carbon and are able to be reclaimed, reused or recycled. All products do not require for service any petroleum based or inorganic chemical treatments adhesives or coatings. All products do not require for service any specialized handling storage or disposal procedures and generate zero post-industrial or post-consumer non-biodegradable waste. All products are also safe for human and animal contact, meet Low VOC emission standards and meet International Building Code and International Residential Code requirements for naturally durable wood.

A.6.2. Option B: USGBC/LEED compliant specifications only.

All lumber shall be FSC (Forest Stewardship Council) certified.

B. PHYSICAL PROPERTIES –

B.1 Minimum Mechanical properties -

B1.1. The Iron Woods™ supplied shall meet or exceed mechanical properties in accordance with ASTM D - 143 standard testing methods associated with the species supplied

B.2 Minimum Physical Properties:

B.2.1 Lumber supplied shall meet or exceed all requirements for tropical hardwood switch ties in accordance with the current Chapter 30 of the AREMA Manual for Railway Engineering, except as otherwise indicated below definitions:

- A. A switch tie or crosstie is any tie of nominal maximum length greater than 50 inches.
- B. A tie block is any tie of nominal maximum length less than or equal to 50 inches.
- C. A bark seam is a pocket or patch of bark partially or wholly enclosed in the wood.
- D. Slanting Grain is a deviation of the fiber from a line parallel to the sides of the piece.
- E. A large knot is a knot greater than ¼” of the width of the surface of which it appears.
- F. Numerous knots shall be any number of knots equaling a large knot in damaging effect.
- G. Rail bearing areas shall be as defined in the following Sections of these Specifications:
 - Switch Ties.....Section 40
 - Cross Ties.....Section 41
 - Tie Blocks.....Section 77
- H. A large hole is either:
 - A cavity within the rail bearing area of the tie or tie block which is more than ½” in diameter and more than 1-1/2 inches deep, or a hole of any diameter less than ½ inch but up to 3 inches deep.
 - A cavity outside the rail bearing area of the tie block which is greater in diameter than ¼ the width of the surface on which it appears



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and more than 1-1/2 inches deep.

- I Numerous holes shall be any number of holes equaling a large hole in damaging effect.
- J. End check is a separation of the wood along any end surface of a cross tie or tie block.
- K. A check is a separation of the wood along only one face of the cross tie or tie block.
- L. A ring shake is a separation along the grain between annual growth rings.
- M. An edge is the intersection of two surfaces.
- N. A split is a separation of the wood extending from one surface, through the piece, to an opposite surface to the adjacent surface.
- O. Ends are considered to be both a surface and a face.
- P. Twist means that any point of a face is not on a plane defined by three of the adjacent corners of that face.
- Q. Bow means that the piece is bent either in its horizontal or vertical plane, but its ends are parallel to each other and without relative rotation with respect to each other
- R. A corner is the intersection of three edges,
- S. Top is the horizontal face farthest from the heartwoods or the narrowest horizontal face if the heartwood is centered. Sides are the vertical faces immediately adjacent to the top face.

B.2 Minimum Mechanical Properties:

B.2.1 Mechanical Properties of Deck Panels/Decking: Meet or exceed the following when tested in accordance with ASTM D143:

1. Bending Strength: 22,445 psi
2. Modulus of Elasticity: 3,145,000 psi/
3. Compression Parallel to Grain: 13,140 psi.
4. Compression Perpendicular to Grain: 3,595 psi.
5. Average Air-Dry Density: Ranges from 56.7 to 59.3pcf.
6. Basic Specific Gravity: Ranges from 0.85-0.97.

B.2.2 Allowable Design Values For Wood Based On ASTM 245 - Dimension Lumber and Decking (.75" to 4" thick by 2" and wider):
Meet or exceed the following when Tested in Accordance with ASTM D-143

D.1 Premium Select Architectural Grade:

7. Bending Strength: 6,750 psi
8. Modulus of Elasticity: 3,300,000 psi/
9. Compression Parallel to Grain: 3,800 psi.
10. Compression Perpendicular to Grain: 2,205 psi.
11. Shear Parallel To Grain: 995 psi.
12. Average Air-Dry Density: Ranges from 56.7 to 59.3pcf.
13. Basic Specific Gravity: Ranges from 0.85-0.97.

C. Marking:

- C.1.** Tropical hardwood switch ties, cross ties and tie blocks shall be marked after seasoning in accordance with the AREMA Manual, Chapter 30. Specifications for Timber Cross ties, Marking Ties to Indicate Size Acceptance, except as specified below:
- A.** Marking shall indicate the manufacturers name or trademark, the month and year of production and the manufacturer's plant identification in figures at least ½ inch high. If dating nails are used, only the last two digits of the year of manufacture shall be shown.
 - B.** Marking shall be by either dating nails, hot-iron branding or tagging on the middle of the tie and/or timber top surface. When anti-splitting devices are applied, brands or tags shall appear in the middle of the top surface of the tie or timber. Tags, if used shall be of stainless steel conforming to ASTM Designation A176. Dating nails shall conform to the requirements of the AREMA Manual for Railway Engineering chapter 3 Ties and Wood Preservation, section 1.8, Specifications for Dating Nails, dated 1975 or later.

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C.2. Each bundle of tropical hardwood ties, cross ties or tie blocks accepted by the Rail Road Governing Body shall be branded by the Rail Road Governing Body inspector by hammering a distinctive mark approved by the Rail Road Governing Body for this purpose. The exposed face of each tie or tie block in each bundle and the end of each tie or tie block in the middle shall be clearly marked.

D. GRADE:

D.1. Minimum Grade Requirements

D.1.1 The timber from which tropical hardwood switch ties, cross ties and tie blocks are produced shall be cut from straight healthy trees of good quality. The category of application of tropical hardwood shall be considered as “Structural Use” or better.

D.1.2. Tropical hardwood switch ties, cross ties and tie blocks shall be free from any defects that could impair their durability or structural strength as ties or tie blocks, as follows:

- A. Decay and Pith:**
Cross and tie blocks having decay and/or pith will be rejected. Brown-to-red and white-to yellow mold stains are not allowed.
- B. Sapwood:**
Crossties and tie blocks with sapwood in the rail bearing areas shall be rejected. Outside the rail bearing areas tropical hardwood cross ties and tie blocks with sapwood exceeding a maximum thickness of ½ inch on any face will be rejected. Care must be taken to differentiate between sapwood and transition wood (young heartwood), the latter being allowed.
- C. Bark Seams:** Cross ties and tie blocks with bark seams located more than 1 inch below the surface anywhere within the volume defined by the rail bearing are and the depth of the cross tie or tie block under it shall be rejected. Outside the rail bearing areas, bark seams located more than 2 inches below the surface will be rejected.
- D. Slanting Grain:** Cross ties and tie blocks with slanting grain (where applicable – does not apply to woods with interlocking grain), in excess of 1 inch in any 15 inches of length, will be rejected.
- E. Twist:** Cross ties and tie blocks with twist will be rejected.
- F. Bow:** Switch ties, cross ties and tie blocks with excessive bending (see paragraph 80.2.2.C.1 below) in either the horizontal or vertical planes will be rejected.
- G. Large Knots and Numerous Knots:** Cross ties and tie blocks with large knots, or numerous knots, inside the rail bearing sections will be rejected. Firm and fixed large knots outside the rail bearing section are acceptable.
- H. Large holes and Numerous Holes:** Cross ties and tie blocks with large holes or numerous holes will be rejected. Borer holes that are not associated with decay are allowed, if they are small (less than 1/8inch in diameter).

D.1.3. Tropical hardwood switch ties, cross ties and tie blocks shall be straight on all surfaces, with the opposite sides parallel. Cross ties and tie blocks will be considered straight when the surface of their top and either sides do not deviate from a straight line from the middle of one end of the middle of the other end at any point more than the following:

A. Switch Ties and Cross Ties:

<u>Overall Length</u>	<u>Top</u>	<u>Side</u>
4 ft-2 in. to 12 ft.	5/16 in.	5/8 in
12 ft to 15 ft	½ in.	1 in.
15 ft. to 18 ft.	¾”	1-3/16 in.
18 ft. to 25 ft.	1 in.	1-9/16 in.
25 ft. and up	1-1/4 in.	1-3/4 in.

A. Tie Blocks

<u>Overall Length</u>	<u>Top</u>	<u>Side</u>
4 ft. -2 in or less	1/8 in.	5/16 in.

D.1.4. Tropical hardwood switch ties, cross ties and tie blocks, with or without anti-splitting devices, with any of the following defects shall be rejected:

- A.** Any wood separation greater than 18 inches in length (and more than 1/16 inch wide and 1/8” deep) shall be cause for rejection.
- B.** Checks over 1-1/2 inches deep or ½” wide (or wider) on any face and longer, in aggregate, than 1/3 of the length of the switch tie, cross tie or tie block shall be cause for rejection.

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- C. Shake greater than 1/3 of the width of the switch tie, cross tie or tie block, or any shakes less than 1 inch from any edge shall be cause for rejection.
 - D. Splits prior to seasoning shall be cause for rejection.
- D.1.5. Any mechanical anti splitting devices employed shall be located to cover the greatest area of wood separation on end surfaces, including checks and end checks.

E. PACKAGING:

E.1. Minimum packaging requirements

E.1.1 Strapping: All Units are to be individually strapped to wood pallets or blocking of a minimum thickness to allow the egress of lift forks using high strength strapping with a minimum of 4 straps per crate.

E.1.2 Storage: All units will be stored out of direct sunlight and protected from the weather until delivered to Rail Road.

F. Quality Control:

F.1. Tropical hardwood switch ties, cross ties, and tie blocks, and all materials and processes, shall be subject to inspection prior to shipment to Rail Road facilities. The Vendor shall afford Rail Road inspector, at no additional cost to Rail Road, all necessary facilities, equipment and labor at the manufacturers plant to enable Rail Road inspector to perform proper inspections, as deemed necessary by Rail Road, during normal working hours.

F.2. Rail Roads inspector will make reasonably close inspection of the Top, bottom, sides and ends of each tropical hardwood switch tie, cross tie and tie block subsequent to seasoning. Each tie block shall be judged independently without regard for decisions on other ties or tie blocks in the same lot.

F.3. Rail Road inspector will inspect the processes relative to seasoning tropical hardwood switch ties, cross ties and tie blocks in accordance with these specifications.

F.4. Inspection of tropical hardwood switch ties, cross ties and tie blocks regarding their conformance with the moisture content requirements shown in paragraph 80.2.4.B.1 shall be performed using a Brookhuis FMD Moisture Meter, or functional equivalent (if an equivalent moisture meter is used, it must have any of the wood species listed in A.0. pre-programed as one of the choices). Moisture content shall be determined at a depth of not less than 1 inch from the top or bottom surface of the approximate mid-point of the length of the tie block, tie or timber.

F.5. Rail Road reserves the right to make any additional inspections of the tropical hardwood switch ties, cross ties and tie blocks prior to seasoning and subsequent to seasoning, during fabrication and after delivery to determine conformity to these specifications.

G. SOURCES:

G.1. Tropical Forest Products, Phone: 786-395-2974 Website: www.tropicalforestproducts.com,
E-Mail: info@tropicalforestproducts.com

Specification Note: The importance of listing the Vendor from which a specification is derived is a designers best assurance of project specification compliance.

H. SUBMITTALS:

H.1. Minimum Technical Documentation Requirements: Document samples shall be submitted with bid as verification of vendor ability to comply. Original submittals shall be supplied upon delivery.

H.1.1. Certificate of Compliance “Inspection” - A vendor certificate confirming product compliance with grade and quality requirements.



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H.1.2. Certificate of Compliance “Technical” – A vendor certificate confirming product compliance with minimum specified Physical, Mechanical and Technical performance requirements as defined by the specification.

H.1.3. MSDS Wood Dust (Material Safety Data Sheet) – Submit a Material Safety and Data Sheet for the wood products supplied on the project.

H.2. Minimum Environmental Documentation Requirements: Document samples shall be submitted with bid as verification of vendor ability to comply. Original submittals upon delivery:

H.2.1. Certificate of Compliance FSC Controlled Wood Chain Of Custody *compliant specifications only.*

H2.1.1. Vendor must submit a valid certificate verifying FSC Chain of Custody Certification Status accompanied by Certificate verifying that materials supplied have been sourced as FSC certified.

Or

H.2.1.2. Certificate of Compliance LEGAL LUMBER™ or Pre Approved Equal Third Party Due Care Compliance Program -

Vendor must submit documented, comprehensive and verifiable Policies and Procedures outlining step by step a process

of independent third party NGO legal verification and accountability related to Environmental Compliance Submittals.

Vendor must submit a certificate confirming compliance with all domestic and international laws pertaining to the legal harvest and trade of forest products, including but not limited to U.S Lacey Act, U.S. Foreign Corrupt Practices Act, U.S. Forced Labor Laws, U.S. Buy American Act, CITES (Convention on the International Trade of Endangered Species)

ITTA (International Trade Agreement) as per LEGAL LUMBER™ Controlled Wood, Chain of Custody, Life Cycle Impact and Due Care Policies and Procedures.

End of Specification V061521