UNION PACIFIC RAILROAD

GRADING RULES AND GUIDELINES

FOR

FOREST PRODUCTS

PREPARED BY
THE FOREST PRODUCTS GROUP
OF THE UNION PACIFIC RAILROAD

VIEW ON UPRR WEBSITE
http://www.up.com/suppliers/supplier_specifications/index.htm

QSP 301 - SUPPLIER ITEM GRADING RULES AND GUIDELINES

September 11, 2015
Union Pacific Railroad – Forest Products Group

Next to each grading rule and guideline is a designated letter indicating the importance of each section. The definition of each letter is as follows:

C means critical.	No variance from grading rules and guidelines allowed.
M means major.	Variance from grading rules and guidelines not generally permitted, allowed only for good and substantial reason, justified by supplier and acceptable to the Union Pacific/User.

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GREEN TIES -
OAK, MIXED HARDWOOD AND SOUTHERN YELLOW PINE CROSSTIES

1. MATERIAL (C)

To be sawn from sound, straight, live timber, free from all bark that impairs treatability and/or any defect that might impair durability or strength.

2. SIZES AND GRADES (C)

6" x 8" x 8' - Grade 3 - AREMA*
7"x (8”-9") x 8'6” Yard & Side Track Tie*
7” x 9” x 8’ – Grade 5 – AREMA*
7” x 9” x 8’6” – Grade 5 – AREMA*
7" x 9" x 9' - Grade 5 - AREMA*

*And the following grading rules and guidelines

Industrial Ties – Downgraded ties may be purchased at the Railroad’s discretion as an industrial grade tie. No rot allowed.

3. SPECIES (C)

The following species will be acceptable:

Ashes	Cherries	Hickories	Oaks	Walnuts
Beech	Elm	Locusts	Sycamores	Cypress
Birches	Gums	Hard Maples	Southern Yellow Pine*	

*Only if specifically listed on Purchase Order

4. SPECIES MIX (M)

Shipments to be not less than 75% oak/hickory and not more than 25% mixed hardwood.

5. DIMENSIONS (C)

Maximum of 0" under or ½” over will be accepted for width and thickness for Grade 3 & Grade 5 ties.

Maximum of ½” under or ¾” over will be accepted for width and thickness for Yard and Side Track Ties.

6. LENGTH (M)

Will not accept multiples or combinations
0" under, 8" over for 6" x 8" x 8' and 7" x 9" x 8' ties.
2” under, 4” over accepted for Yard and Side Track Ties

0" under, 4" over for 7" x 9" x 8'6" and 7"x9"x9' ties.

Pre-processed air dried ties are to be cut to length per Section B of Material Handling Grading Rules and Guidelines at timber treating plant.

Grade Ties to be cut square at the ends. Ties that cannot be properly double-end trimmed at the treating plant are subject to rejection or degrade.

7. WANE (C)

Minimum 7" face for Grade 3 ties.
Minimum 8" face for Grade 5 ties, in the area 20” – 40” (rail bearing area) from the center of the tie.
Minimum 6” face for Yard and Side Track Ties.

These minimum face requirements apply to the entire length of the tie for Grade 3 and Yard and Side Track Ties. All wane to be free of all bark. In the area between the two rail-bearing areas a minimum of 7 ¼” face is permitted on Grade 5 ties.

WANE (M)

Wane on the end of the ties will be permitted as long as it does not prohibit proper seating of end-plates.

8. KNOTS (M)

A knot exceeding in diameter 1/4 of the width of the surface on which it appears will be rejected if it occurs in the rail bearing area. Outside the rail bearing area, knots will be accepted up to a diameter of 1/3 of the surface on which they appear. A cluster of knots will be judged as being a large knot in damaging effect. Rail bearing area is defined as 20" - 40" from center of the tie.

9. HOLES (M)

The following will be rejected:

a. A large hole inside the rail bearing area-defined as being more than ½” in diameter and 3” deep.
b. A large hole outside the rail bearing-defined as being more than 1” in diameter and 3” deep.
c. Numerous holes; defined as having any number equaling a large hole in damaging effect.

10. SLOPE OF GRAIN (C)

No ties accepted with excessive slope of grain (1” in 15”).

11. SHAKE (C)

A tie containing a shake more than 1/8” wide and/or length of more than 1/3 the width of the tie and within 1" of any face will be rejected. Fire scar will be considered as shake.

12. SPLIT (M)

A grade tie containing a split 5" or more long and 3/8” in width that cannot be effectively end-plated will be rejected. A Yard and Side Track Tie containing a split greater than 10” in length and ¾” in width will be rejected.

13. HEART CHECK (M)

A tie with heart-checks that go into the tie plate area will be rejected if the check is more than ½” cumulative wide or if check causes plate area to be convex/concave.

14. STRAIGHTNESS (M)

Straightness will be measured from any edge of a tie to a straight line parallel to the edge of the tie. This will be true for the top to bottom of the tie, as well as from side to side of the tie. No tie will deviate from straightness by more than 1” along its length.

15. BARK SEAMS (M)

A bark seam or pocket is a patch of bark partially or wholly enclosed in the wood. Bark seams will be allowed outside the rail bearing area if they are not more than 2” below the surface, ¼” in width and not more than 4” long.

16. MANUFACTURING DEFECTS (M)

Any tie containing a manufacturing defect will be evaluated by the Inspector and judged accordingly.

17. STUMP PULL (M)

Stump pull will be graded the same as a split in the end of a tie. A stump pull that goes into the interior of the tie more than 5" will be rejected.

18. GROWTH RINGS/RESISTANCE TO WEAR (M)

Grade softwood ties shall be of compact wood throughout the outer fourth of the tie, where every inch of radius from the pith shall have 6 or more rings of annual growth. Softwood Grade Ties are also acceptable if their entire cross section contains not less than four growth rings per inch with all rings composed of not

less than 50% summerwood.

19. TRUCK TIES (M)

All trucked ties to have a pre-numbered shipping ticket accompanying each truck load, referencing UPRR purchase order number. Each truck to have adequate dunnage to allow forklift unloading.

20. RAIL TIES (M)

All inbound ties shipped by rail require supplier to send shipping notice to applicable treating plant at time of shipment. Ties to be loaded securely in gondolas or flat cars in uniform tiers suitable for grapple or forklift unloading in accordance with railroad shipping requirements. For treating plants in which boxcars are approved for tie unloading, ties to be loaded and braced appropriately to a allow forklift unloading at destination. Shipment to be made in Union Pacific supplied railroad cars to the maximum extent possible, and cars will be loaded to the practical maximum capacity. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limits. Cars must not be loaded with ties above the shell capacity of the car and in compliance with AAR Rules For Safe Handling And Transportation Of Material.

21. LOADING (M)

Mixed lengths not to be loaded on the same car or truck unless permission is granted by the U.P. Material Manager-Ties. Any exception to be short term.

22. INSPECTION (C)

Union Pacific Material Manager-Ties will direct inspection of all ties at a timber treating plant. Any ties that are rejected at the treating plant will not be paid for. Rejects will be returned to suppliers for a nominal charge covering banding and loading on trucks. Railroad reserves the right to bill supplier for handling and freight charges covering reject ties. It is not the intent of the Union Pacific to acquire reject ties at the treating plant. Therefore, any ties rejected at the treating plant will be set aside for your disposition. If written advice is not received from the supplier within 30 days after receipt of reject ties, they will be disposed of at the railroad's discretion.

GREEN TIES -
WESTERN CROSSTIES

Cross ties must be manufactured according to W.C.L.I.B. Grading Rules and the following grading rules and guidelines:

1. MATERIAL (C)

To be sawn from sound, straight live timber, free from all bark that impairs treatability and/or any defect that might impair durability or strength.

2. SIZES AND GRADES (C)

No. 1 - Railroad Ties - Par. 192B West Coast Lumber Inspection Bureau (WCLIB) Grading Rules for West Coast Lumber - latest revision and the following requirements. Will not accept No. 2 ties.

7” x (8”-9”) x 8’6” Yard & Side Track Ties
7" x 9" x 8' - No. 1*
7” x 9” x 8’6” - No. 1*
7" x 9" x 9' - No. 1*

*And the following grading rules and guidelines

Industrial Ties – Downgraded ties may be purchased at the Railroad’s discretion as an industrial grade tie. No rot allowed.

3. SPECIES (C)

Manufactured from Douglas Fir, Western Hemlock*, Hem-Fir (no Sub-Alpine Fir or Spruce accepted)*, Ponderosa Pine*, Lodgepole Pine* and Larch*.

*Only if specifically listed on Purchase Order

4. DIMENSIONS (C)

Maximum of 0" under or ½” over will be accepted for width and thickness for No. 1 ties. Maximum of ½” under or ¾” over will be accepted for width and thickness for Yard and Side Track Ties.

5. LENGTH (M)

Will not accept multiples or combinations.
0" under, 8" over for 7" x 9" x 8'.
2” under, 4” over accepted for Yard and Side Track Ties.
0" under, 4" over for 7" x 9" x 8'6” and 7” x 9” x 9’ ties.

Ties to be cut square at the ends. Ties that cannot be properly double-end trimmed at the treating plant are subject to rejection.

6. WANE (C)

Minimum 8" face for No.1 ties, in the area 20” – 40” (rail bearing area) from the center of the tie. In the area between the two rail-bearing areas a minimum of 7-¼” face is permitted on No.1 ties.

Minimum 6” face for Yard and Side Track Ties.

All wane to be completely free of all bark.

WANE (M)

Wane on the end of the ties will be permitted as long as it does not prohibit proper seating of end-plates.

7. KNOTS (M)

A knot exceeding in diameter 1/4 of the width of the surface on which it appears will be rejected if it occurs in the rail bearing area. Outside the rail bearing area, knots will be accepted up to a diameter of 1/3 of the surface on which they appear. A cluster of knots will be judged as if they were a large knot in damaging effect. Rail bearing area is defined as 20" - 40" from the center of the tie.

8. HOLES (M)

The following will be rejected:

a) A large hole inside the rail bearing area-defined as being more than ½” in diameter and 3” deep.
b) A large hole outside the rail bearing-defined as being more than 1” in diameter and 3” deep.
c) Numerous holes; defined as having any number equaling a large hole in damaging effect.

9. SLOPE OF GRAIN (C)

No ties accepted with excessive slope of grain (1” in 15”).

10. SHAKE (C)

A tie containing a shake more than 1/8” wide and/or length of more than 1/3 the width of the tie and within 1" of any face will be rejected. Fire scar will be considered as shake.

11. SPLIT (M)

A tie containing a split 5" deep or more long and 3/8” in width that cannot be effectively end-plated will be rejected. A Yard and Side Track tie containing a split greater than 10” in length and ¾” in width will be rejected.

12. HEART CHECK (M)

A tie with heart-checks that go into the tie plate area will be rejected if the check is more than ½” cumulative wide or if check causes plate area to be convex/concave.

13. STRAIGHTNESS (M)

Straightness will be measured from any edge of a tie to a straight line parallel to the edge of the tie. This will be true for the top to bottom of the tie, as well as from side to side of the tie. No tie will deviate from straightness by more than 1” along its length.

14. BARK SEAMS (M)

A bark seam or pocket is a patch of bark partially or wholly enclosed in the wood. Bark seams will be allowed outside the rail bearing area if they are not more than 2” below the surface, ¼” in width and not more than 4” long.

15. MANUFACTURING DEFECTS (M)

Any tie containing a manufacturing defect will be evaluated by the Inspector and judged accordingly.

16. STUMP PULL (M)

Stump pull will be graded the same as a split in the end of a tie. A stump pull that goes into the interior of the tie more than 5" will be rejected.

17. GROWTH RINGS/RESISTANCE TO WEAR (M)

Grade softwood ties shall be of compact wood throughout the outer fourth of the tie, having 6 or more rings per inch of annual growth. Grade softwood ties are also acceptable if their entire cross section contains not less than four growth rings per inch with all rings composed of not less than 50% summerwood.

18. TRUCK TIES (M)

All trucked ties to have a pre-numbered shipping ticket accompanying each truck load, Referencing UPRR Purchase order number. Each truck to have adequate

dunnage to allow forklift unloading.

19. RAIL TIES (M)

All inbound ties shipped by rail require supplier to send shipping notice to applicable treating plant at time of shipment. Ties to be loaded securely in gondolas or flat cars in uniform tiers suitable for grapple or forklift unloading in accordance with railroad shipping requirements. For treating plants in which box cars are approved for tie unloading, ties to be loaded and braced appropriately to a allow forklift unloading at destination. Shipment to be made in Union Pacific supplied railroad cars to the maximum extent possible, and cars will be loaded to the practical maximum capacity. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limits. Cars must not be loaded with ties above the shell capacity of the car and in compliance with AAR Rules For Safe Handling And Transportation Of Material.

20. LOADING (M)

Mixed lengths are not to be loaded on the same car or truck unless permission is granted by the U.P. Material Manager-Ties. Any exceptions to be short term.

21. INSPECTION (C)

Union Pacific Material Manager-Ties will direct inspection of all ties at a timber treating plant. Any ties that are rejected at the treating plant will not be paid for. Rejects will be returned to suppliers for a nominal charge covering banding and loading on trucks. Railroad reserves the right to bill supplier for handling and freight charges covering reject ties. It is not the intent of the Union Pacific to acquire reject ties at the treating plant. Therefore, any ties rejected at the treating plant will be set aside for your disposition. If written advice is not received from the supplier within 30 days after receipt of reject ties, they will be disposed of at the railroad's discretion.

GREEN -
GUMWOOD CROSSING BLANKS

1. MATERIAL (C)

To be sawn from sound, straight, live timber, free from all bark that impairs treatability and/or any defect that might impair durability or strength.

2. SIZES AND GRADES (C)

4”x8 ½”x8'6" - sound, square cut
8 ½”x9"x8'6" - sound, square cut

*And the following grading rules and guidelines

3. SPECIES (C)

Gumwood - No other species accepted.

4. DIMENSIONS (C)

Maximum of 0" under or ½” over will be accepted for width and thickness.

5. LENGTH (M)

Will not accept multiples or combinations.
0" under, 4" over.
Blanks that cannot be properly double-end trimmed to 8' -1 ¼” at the treating plant are subject to rejection.

6. WANE (C)

The following minimum face requirements apply to the entire length of the blank.
No more than ½” wane for both blank sizes. All wane to be completely free of all bark.

7. KNOTS (M)

A knot exceeding in diameter 1/3 of the width of the surface on which it appears will be rejected. A cluster of knots will be judged as being a large knot in damaging effect.

8. HOLES (M)

The following will be rejected:

(a) A large hole more than ½” in diameter and 3” deep.

(b) Numerous holes; defined as having any number equaling a large hole in damaging effect.

9. SLOPE OF GRAIN (C)

No blanks accepted with excessive slope of grain (1” in 15”).

10. SHAKE (C)

Blanks containing a shake more than 1/8” wide and/or length of more than 1/3 the width of the blanks and within 1" of any face will be rejected. Fire scar will be considered as shake.

11. SPLIT (M)

Blanks containing a vertical split 5" deep or 1/8” wide will be rejected. Blanks containing a horizontal split 7" deep or 1/8” wide will be rejected.

12. STRAIGHTNESS (M)

Straightness will be measured from any edge of a blank to a straight line parallel to the edge of the blank. This will be true for the top to bottom of the blanks, as well as from side to side of the blank. No blank will deviate from straightness by more than 1” along its length.

13. BARK SEAMS (M)

No blank will be accepted that contains more than a minimal amount of bark.

14. HEART CHECK (M)

Blanks with heart-checks will be rejected if the check is more than ½” cumulative wide or if check causes surface area to be convex/concave where it would be unlikely to allow a flat surface.

15. MANUFACTURING DEFECTS (M)

Any blank containing a manufacturing defect will be evaluated by the Inspector and judged accordingly.

16. STUMP PULL (M)

Stump pull will be graded the same as a split in the end of a blank. A stump pull that goes into the interior of the blank more than 5" will be rejected.

17. TRUCK BLANKS (M)

All trucked ties to have a pre-numbered shipping ticket accompanying each truck load, referencing UPRR purchase order number. Each truck to have adequate dunnage to allow forklift unloading.

18. RAIL BLANKS (M)

All inbound blanks shipped by rail require supplier to send shipping notice to applicable treating plants at time of shipment. Blanks to be loaded securely in gondolas or flat cars in uniform tiers suitable for grapple unloading in accordance with railroad shipping requirements. Shipment to be made in Union Pacific supplied railroad cars to the maximum extent possible, and cars will be loaded to the practical maximum capacity. Cars must not be loaded with ties above the shell capacity of the car. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limits and in compliance with AAR Rules For Safe Handling And Transportation of Materials.

19. LOADING (M)

Mixed sizes may be loaded on the same car or truck. All shipments to represent a 5 to 1 ratio of 8 ½" to 4" unless otherwise specified.

20. INSPECTION (C)

Union Pacific Material Manager-Ties will direct inspection of all blanks at a timber treating plant. Any blanks that are rejected at the treating plant will not be paid for. Rejects will be returned to suppliers for a nominal charge covering banding and loading on trucks. Railroad reserves the right to bill supplier for handling and freight charges covering reject blanks. It is not the intent of the Union Pacific to acquire reject blanks at the treating plant. Therefore, any blanks rejected at the treating plant will be set aside for your disposition. If written advice is not received from the supplier within thirty (30) days after receipt of reject ties, they will be disposed of at the railroad's discretion.

GREEN OAK RAIL CROSSING TIMBERS

1. MATERIAL (C)

To be sawn from sound, straight, live timber, free from any defect that impairs treatability and/or any defect that might impair durability or strength.

2. SIZES (C)

8” x 10” x 8’-25’ – solid sawn
8” x 12” x 16’ – solid sawn
10” x 10” x 8’-22’ – solid sawn
8” x 24” x 10’-15’ – laminated or solid sawn

If laminated, the following applies:
Dowels per finished piece no more than, 39” apart, 9” from the ends

Dowels to meet ASTM A-36 and be produced within the following dimensions (diameter tolerance to be within 1/64") see Dowell Laminated Ties contained herein.

The dowels will be ¾” steel, with twist. 21” dowels for the 8” x 22” timbers and 23” dowels for the 8” x 24” timbers.

Timber sized for the 8” x 24” x 10’-15’ will be 8” x 12” x 10’-15’.

3. SPECIES (C)

Only red or white oak will be allowed.

4. DIMENSIONS (C)

Tolerances are 0" under and ½” over for width and thickness.

5. LENGTH (M)

0" under and 4" over optimal lengths will be permitted.

6. WANE (C)

Minimum 9" face for 10" wide timbers.
Minimum 11” face for 12” wide timbers.
Minimum 23” face for 24” wide timbers.
These minimum face requirements apply to the entire length of the timber. All wane to be free of all bark.

7. KNOTS (M)

On 8"x10", 8” x 12” and 10” x 10” timbers, a knot exceeding in diameter 1/4 the width of the surface on which it appears will be rejected.

On 8” x 24” timbers, a knot exceeding 2" in diameter will be rejected if it occurs on the 8" face.

On 8” x 24” timbers, a knot exceeding 4" in diameter will be rejected if it occurs on the face.

A cluster of knots will be graded as being a large knot in damaging effect.

8. HOLES (M)

The following will be rejected:

(a) A large hole more than ½” in diameter and 3” deep.
(b) Numerous holes; defined as having any number equaling a large hole in damaging effect.

9. SLOPE OF GRAIN (C)

No timbers accepted with excessive slope of grain (1" in 15").

10. SHAKE (C)

Timbers containing a shake more than 1/8” wide and/or length of more than 1/3 the width of the tie and within 1" of any face will be rejected. Fire scar will be considered as shake.

11. SPLIT (M)

Timbers containing a split 5" or longer that has not been properly end-plated will be rejected.

12. HEART CHECK (M)

Timbers with heart-checks that go into the interior of the timber will be rejected if the check is more than ½” cumulatively wide or if check causes tie to be convex/concave where it would unlikely allow a flat surface

13. STRAIGHTNESS (M)

A timber will be considered straight when it is within 1" of straight for twist, bow and crook for the entire length of the timber.

No timber will deviate from straightness by more than 1" per lineal 9' section, prorated over the length of the tie and rounded to the nearest ½" along its length. Straightness will be measured from any edge of a timber to a straight line parallel to the edge of the timber. This will be true for the top to bottom of the timber, as well as from side to side of the timber.

14. BARK SEAMS (M)

No timber will be accepted that contains more than a minimal amount of in-grown bark.

15. MANFUCTURING DEFECTS (M)

Any timber containing a manufacturing defect will be evaluated by the Inspector and graded accordingly.

16. STUMP PULL (M)

Stump pull will be graded the same as a split in the end of a timber. A stump pull that goes into the interior of the timber more than 5" will be rejected.

17. INCISING (M)

Timbers to be incised according to the AREMA Manual for Railroad Engineering Chapter 30-most recent revision.

18. END-PLATING (M)

Timbers to be end-plated with Union Pacific approved anti-split device. End-plates to be centered on each end to maximize coverage over any split that may be developing. All end plates to be flush on the end of each timber. On larger timbers, enough plates are to be applied to cover as much of the end as practical.

19. TRUCK TIMBERS (M)

All trucked timbers to have a pre-numbered shipping ticket accompanying each truck load, referencing UPRR purchase order number. Each truck to have adequate dunnage to allow forklift unloading.

20. RAIL TIMBERS (M)

All inbound timbers shipped by rail require supplier to send shipping notice to applicable treating plant at time of shipment. Timbers to be loaded securely in gondolas or flat cars in uniform tiers suitable for grapple unloading in accordance with railroad shipping requirements. Shipment to be made in Union Pacific Railroad cars to the maximum extent possible, and cars will be loaded to the

practical maximum capacity. Cars must not be loaded with timbers above the shell capacity of the car. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limit and in compliance with AAR Rules For Safe Handling And Transportation Of Material.

21. LOADING (M)

Mixed sizes are permitted on same car/truck as long as similar dimensions are segregated together as much as possible and properly identified.

22. INSPECTION (C)

Union Pacific Material Manager-Ties will direct inspection of all timbers at the timber treating plant. Any timbers that are rejected at the treating plant will not be paid for. Rejects will be returned to suppliers for a nominal charge covering banding and loading on trucks. Railroad reserves the right to bill supplier for handling and freight charges covering reject timbers. It is not the intent of the Union Pacific to acquire reject timbers at the treating plant. Therefore, any timbers rejected at the treating plant will be set aside for your disposition. If written advice is not received from the supplier within 30 days after receipt of reject ties, they will be disposed of at the railroad's discretion.

DOWELL LAMINATED TIES

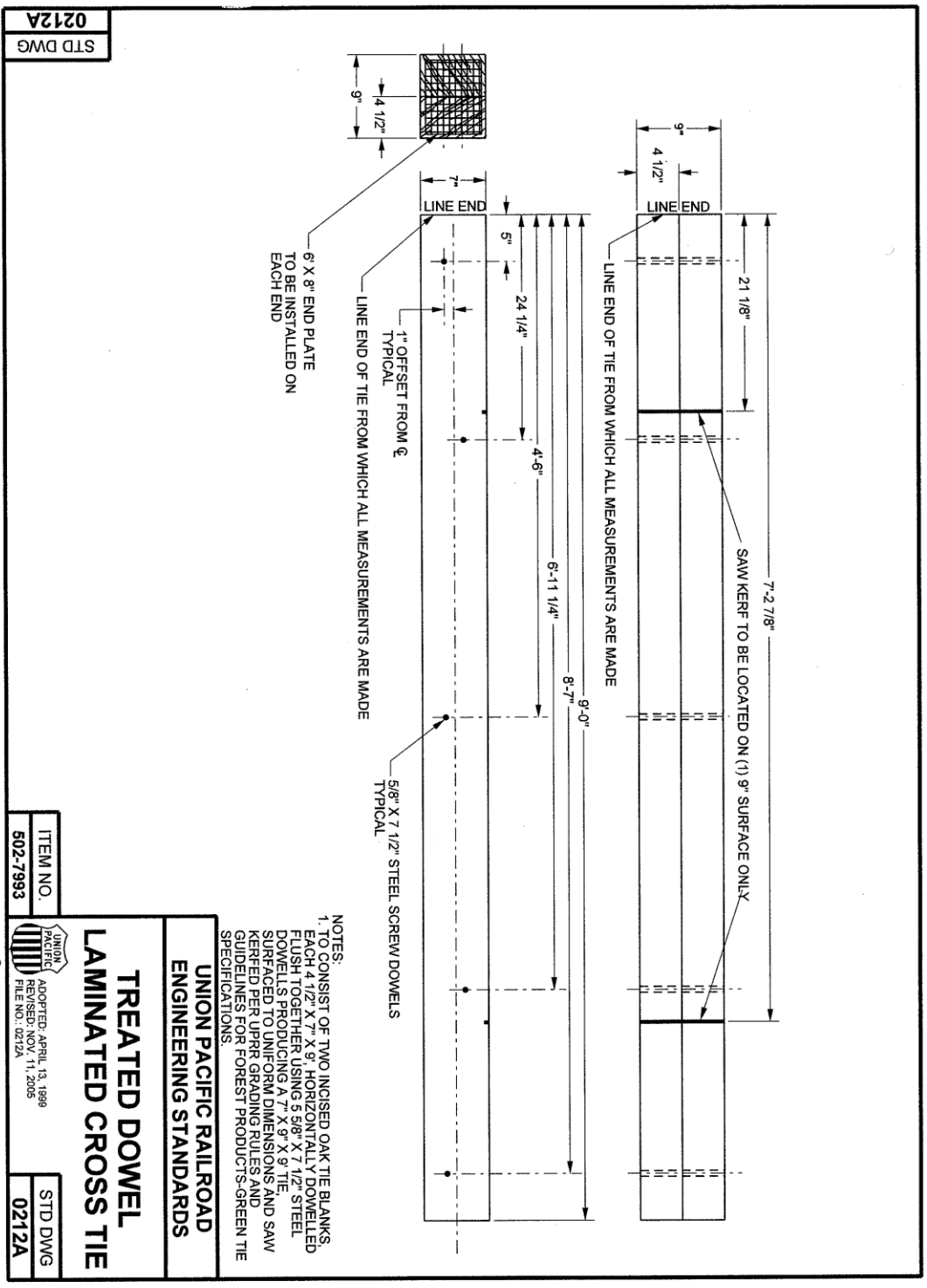
1. Inspect oak tie blanks per Union Pacific Railroad Grading Rules and Guidelines for Forest Products - Green Ties - Oak, and stack for air seasoning per Material Handling Guidelines 1-B-5.

2. When oak blanks reach an average moisture content of 45% (2" oven-dry basis) they will be dowelled together (see diagram on page 20) (M).

3. Dowell laminated crossties will consist of two incised oak tie blanks each measuring 4 ½” x 7” x 9’ horizontally dowelled flush together per attached diagram using five (5) each 5/8” x 7 ½” steel dowells producing 7"x9"x9' DET Ties. Ties to be surfaced to uniform dimensions and saw kerfed per Union Pacific Railroad STD.DWG 0212A latest revision.

Dowels to meet ASTM A-36 and be produced within the following dimensions (diameter tolerances to be within 1/64") (M):

Nominal Basic Diameter	5/8”
Outside Diameter	.687"
Root Diameter	.500"
Pitch	688"
No. in complete turn	3 ¼”
Depth of Thread	.094"
Point Diameter	5/16"


0212A
STD DWG
9"
4 1/2"
7"
LINE END
5"
24 1/4"
4'-6"
6'-11 1/4"
8'-7"
9'-0"
21 1/8"
7'-2 7/8"
LINE END OF TIE FROM WHICH ALL MEASUREMENTS ARE MADE
SAW KERF TO BE LOCATED ON (1) 9" SURFACE ONLY
6' X 8" END PLATE TO BE INSTALLED ON EACH END
1" OFFSET FROM ℄ TYPICAL
LINE END OF TIE FROM WHICH ALL MEASUREMENTS ARE MADE
5/8" X 7 1/2" STEEL SCREW DOWELS TYPICAL
NOTES:
1. TO CONSIST OF TWO INCISED OAK TIE BLANKS, EACH 4 1/2" X 7" X 9', HORIZONTALLY DOWELLED FLUSH TOGETHER USING 5 5/8" X 7 1/2" STEEL DOWELLS PRODUCING A 7" X 9" X 9' TIE. SURFACED TO UNIFORM DIMENSIONS AND SAW KERFED PER UPRR GRADING RULES AND GUIDELINES FOR FOREST PRODUCTS-GREEN TIE SPECIFICATIONS.
UNION PACIFIC RAILROAD
ENGINEERING STANDARDS
TREATED DOWEL
LAMINATED CROSS TIE
ADOPTED: APRIL 13, 1999
REVISED: NOV. 11, 2005
FILE NO.: 0212A
ITEM NO.
502-7993
STD DWG
0212A
Copyright © 2005 by Union Pacific Railroad

IMPORTED TIMBERS – (C)

AZOBE:
Compliance with UP specifications for Green Ties and the following:

Certificate confirming specie to be Lophira alata.
Full Sawn - 0" under, 1/2" over.
Full Length - 0" under, 2" over (DET)
FOHC - 100% free of heart center.
No sapwood.*
No transition zone wood.*
100% heartwood.
Square-edged, no wane.

*If material contains any sapwood or transition zone wood, then all pieces must be treated per specifications contained herein.

GREEN SWITCH TIE GRADING RULES AND GUIDELINES - OAK AND MIXED HARDWOOD

1. MATERIAL (C)

To be sawn from sound, straight, live timber, free from any defect that impairs treatability and/or any defect that might impair durability or strength.

2. SIZES AND GRADES (C)

7" x 9" x 10' - 25'-- Grade 5 - A.R.E.M.A.*

*And the following grading rules and guidelines.

3. SPECIES (C)

The following species will be acceptable:

Ashes	Cherries	Hard Maples
Beech	Gums	Oaks
Birches	Locusts	Walnuts
Hickories		

4. SPECIES MIX (M)

Shipments to be not less than 75% oak/hickory and not more than 25% mixed hardwood.

5. DIMENSIONS (C)

Maximum of 0" under or ½" over will be accepted for width and thickness.

6. LENGTH (M)

Will not accept multiples or combinations.
0" under, 4" over.
To be cut square at the ends. Ties that cannot be properly double-end trimmed at the treating plant are subject to rejection or re-grade to a shorter length.

7. WANE (C)

Minimum 8" face throughout entire length of tie, except for the outer 12". Wane on the outer 12" will be permitted as long as it does not prohibit proper seating of end-plates.

8. KNOTS (M)

A knot exceeding in diameter 1/4 of the width of the surface on which it appears will be rejected. Knots that occur within the outer 12" of each end of the tie will be allowed if they do not exceed in diameter 1/3 of the surface on which they appear. A cluster of knots will be judged as if they were a large knot in damaging effect.

9. HOLES (M)

The following will be rejected:
(a) A large hole inside the rail bearing area-defined as being more than ½" in diameter and 3" deep.
(b) Numerous holes; defined as having any number equaling a large hole in damaging effect.

10. SLOPE OF GRAIN (C)

No ties accepted with excessive slope of grain (1" in 15").

11. SHAKE (C)

Tie containing a shake more than 1/8" wide and/or length of more than 1/3 the width of the tie and within 1" of any face will be rejected. Fire scar will be considered as shake.

12. SPLIT (M)

Tie containing a split 5" or more long and 3/8" in width that cannot be effectively end-plated will be rejected or subject to re-grade to a shorter length.

13. HEART CHECK (M)

Ties with heart-checks that go into tie plate area (12" into interior of the tie) will be rejected if the check is more than ½" cumulative wide or if check causes plate area to be convex/concave.

14. STRAIGHTNESS (M)

Straightness will be measured from any edge of a tie to a straight line parallel to the edge of the tie. This will be true for the top to bottom of the tie, as well as from side to side of the tie. No tie will deviate from straightness by more than 1" per lineal 10' section, prorated over the length of the tie and rounded to the nearest ½" along its length.

15. BARK SEAMS (M)

No tie will be accepted that contains more than a minimal amount of ingrown bark.

16. MANUFACTURING DEFECTS (M)

Any tie containing a manufacturing defect will be evaluated by the Inspector and judged accordingly.

17. STUMP PULL (M)

Stump pull will be graded the same as a split in the end of a tie. A stump pull that goes into the interior of the tie more than 5" will be rejected or subject to regrade to a shorter length.

18. TRUCK TIES (M)

All trucked ties to have a prenumbered shipping ticket accompanying each truck load, Referencing UPRR purchase order number. Each to have adequate dunnage to allow forklift unloading.

19. RAIL TIES (M)

All inbound ties shipped by rail require supplier to send shipping notice to applicable treating plant at time of shipment. Ties to be loaded securely in gondolas or flat cars in uniform tiers suitable for grapple unloading in accordance with railroad shipping requirements. Shipment to be made in Union Pacific supplied railroad cars to the maximum extent possible, and cars will be loaded to the practical maximum capacity. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limits. Cars must not be loaded with ties above the shell capacity of the car and in compliance with AAR Rules For Safe Handling And Transportation Of Material.

20. LOADING (M)

No more than three sizes are to be loaded on the same car or truck. If sizes are mixed, switchties need to be segregated and banded in single-length bundles.

21. INSPECTION (C)

Union Pacific Material Manager-Ties will direct inspection of all ties at a timber treating plant. Any ties that are rejected at the treating plant will not be paid for. Rejects will be returned to suppliers for a nominal charge covering banding and loading on trucks. Railroad reserves the right to bill supplier for handling and freight charges covering reject ties. It is not the intent of the Union Pacific to acquire reject ties at the treating plant. Therefore, any ties rejected at the treating plant will be set aside for your disposition. If written advice is not received from the supplier within 30 days after receipt of reject ties, they will be disposed of at the railroad's discretion.

GREEN SWITCH TIES - DOUGLAS FIR AND WESTERN HEM-FIR

1. MATERIAL (C)

To be sawn from sound, straight, live timber free from all bark that impairs treatability and/or any defect that might impair their durability or strength.

2. SIZES AND GRADES (C)

No. 1 - Switch Ties - Par. 192B West Coast Lumber Inspection Bureau (WCLIB) Grading Rules for West Coast Lumber - latest revision and the following requirements. Will not accept No. 2 ties.

7" x 9" x 10' – 27' – No. 1*

*And the following grading rules and requirements.

3. SPECIES (C)

Douglas Fir and Western Hem-Fir* (no Sub-Alpine Fir or Spruce accepted).

*Only if specifically listed on Purchase Order

4. DIMENSIONS (C)

Maximum of 0" under or ½" over will be accepted for width and thickness.

5. LENGTH (M)

Will not accept multiples or combinations.
Tolerance - 0" under, 4" over. No switch ties will be accepted that are short of length. To be cut square at the end. Ties that cannot be properly double-trimmed at the treating plant are subject to rejection or re-grade to a shorter length.

6. WANE (C)

Minimum 8" face throughout entire length of tie, except for the outer 12". Wane on the outer 12" will be permitted as long as it does not prohibit proper seating of endplates.

7. KNOTS (M)

A knot exceeding in diameter 1/4 of the width of the surface on which it appears will be rejected. Knots that occur within the outer 12" of each end of the tie will be

allowed if they do not exceed in diameter 1/3 of the width of the surface on which they appear. A cluster of knots will be judged as if they were a large knot in damaging effect.

8. HOLES (M)

The following will be rejected:

(a) A large hole inside the rail bearing area-defined as being more than ½" in diameter and 3" deep.

(b) Numerous holes; defined as having any number equaling a large hole in damaging effect.

9. SLOPE OF GRAIN (C)

No ties accepted with excessive slope of grain (1" in 15").

10. SHAKE (C)

Tie containing a shake more than 1/8" wide and/or length of more than 1/3 the width of the tie and within 1" of any face will be rejected. Fire scar will be considered as shake.

11. SPLIT (M)

Tie containing a vertical split 5" deep and 3/8" in width will be rejected. Tie containing a horizontal split 7" deep or 1/8" wide will be rejected or subject to regrade to a shorter length.

12. HEART CHECK (M)

Ties with heart-checks that go into tie plate area (12" into the interior of the tie) surface will be rejected if the check is more than ½" cumulative wide or if check causes plate area to be convex/concave.

13. STRAIGHTNESS (M)

Straightness will be measured from any edge of a tie to a straight line parallel to the edge of the tie. This will be true for the top to bottom of the tie, as well as from side to side of the tie. No tie will deviate from straightness by more than 1" lineal 10' section prorated over the length of the tie and rounded to the nearest ½" along its length.

14. BARK SEAMS (M)

No tie will be accepted that contains more than a minimal amount of ingrown bark.

15. MANUFACTURING DEFECTS (M)

Any tie containing a manufacturing defect will be evaluated by the Inspector and judged accordingly.

16. STUMP PULL (M)

Stump pull will be graded the same as a split in the end of a tie. A stump pull that goes into the interior of the tie more than 5" will be rejected or subject to re-grade to a shorter length.

17. GROWTH RINGS/RESISTANCE TO WEAR (M)

Softwood ties shall be of compact wood throughout the outer fourth of the tie where any inch of any radius from the pith shall have 6 or more rings of annual growth. Softwood ties are also acceptable if their entire cross section contains not less than four growth rings per inch with all rings composed of not less than 50% summerwood.

18. TRUCK TIES (M)

All trucked ties to have a pre-numbered shipping ticket accompanying each truck load, referencing UPRR purchase order number. Each truck to have adequate dunnage to allow forklift unloading.

19. RAIL TIES (M)

All inbound ties shipped by rail require supplier to send shipping notice to applicable treating plant at time of shipment. Ties to be loaded securely utilizing gondolas or on flat cars in uniform tiers suitable for grapple/forklift unloading in accordance with railroad shipping requirements. Shipment to be made in Union Pacific supplied railroad cars to the maximum extent possible, and cars will be loaded to the practical maximum capacity. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limits. Cars must not be loaded with ties above the shell capacity of the car and in compliance with AAR Rules For Safe Handling And Transportation Of Material.

20. LOADING (M)

No more than three sizes are to be loaded on the same car or truck. If sizes are mixed, switchties need to be segregated and banded in single-length bundles.

21. INSPECTION (C)

Union Pacific Material Manager-Ties will direct inspection of all ties at a timber treating plant. Any ties that are rejected at the treating plant will not be paid for.

Rejects will be returned to suppliers for a nominal charge covering banding and loading on trucks. Railroad reserves the right to bill supplier for handling and freight charges covering reject ties. It is not the intent of the Union Pacific to acquire reject ties at the treating plant. Therefore, any ties rejected at the treating plant will be set aside for your disposition. If written advice is not received from the supplier within 30 days after receipt of reject ties, they will be disposed of at the railroad's discretion.

TAPERED TIES

FIGURE A	
A	ITEM NO.
10' SOFTWOOD	502-4300
10' AZOBE	502-4180
11' SOFTWOOD	502-4400
12' SOFTWOOD	502-4490
13' SOFTWOOD	502-4700
14' SOFTWOOD	502-4900
22' SOFTWOOD	502-5300

FIGURE A
TAPERED TIES

FIGURE B
TAPERED AND DAPPED TIES

TAPERED AND DAPPED TIES

FIGURE B	
A	ITEM NO.
14'-6" SOFTWOOD	502-5000
14'-6" AZOBE	502-4850
15'-6" SOFTWOOD	502-5050
15'-6" AZOBE	502-4852

NOTES:
BOTH ENDS OF ALL TIES TO HAVE 7" X 8" END PLATES (EXCEPT AZOBE).

UNION PACIFIC RAILROAD
ENGINEERING STANDARDS

SWITCH MACHINE TIES TAPERED AND DAPPED

UNION PACIFIC
ADOPTED: APRIL 14, 1999
REVISED: JAN. 3, 2001
FILE NO.: 0213A

STD DWG
0213A

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250000
A
A
3"
5'-2"
LENGTH
10"
10"
7"
8"
8"
DAPPED TRAPEZOID
(FOR HEADBLOCKS AND
MOVABLE POINT FROGS)
DAPPED
(FOR MOVABLE POINT FROGS)
TIE TYPE
LENGTH
BNSF ITEM NO.
UPRR ITEM NO.
DAPPED TRAPEZOID (FOR HEADBLOCKS)
14'-0"
058400004*
502-4899**
DAPPED TRAPEZOID (FOR HEADBLOCKS)
16'-0"
058400005*
502-5101**
DAPPED (FOR MOVABLE POINT FROGS)
19'-0"
058400012N*
N/A
*PARALLAM TIE **AZOBE TIE
BNSF RAILWAY
COMMON STANDARDS
TIES FOR POWER
SWITCH LAYOUTS
FILE OWNER: UPRR
DATE: MAR. 7, 2007
REV. NO: 2
DWG NO: 250000

GLUED LAMINATED SOFTWOOD SWITCHTIES

Glued laminated switchties are to meet all provisions of Standard Specifications for Structural Glued Laminated Timber of Softwood Species (AITC 117) latest revision.

Switchties are intended for wet use conditions. Wet use adhesives conforming to Structural Glued Laminated Timber (ANSI/AITC A190) latest revision shall be used.

Switchties shall be fabricated with zero camber. Laminations shall be of one piece in width.

Glued laminated switchties shall be manufactured from species and grades of lumber which produce design values equal to or exceeding the following when loaded perpendicular to the wide faces of the laminations. These minimum design stress values are based on dry conditions.

SIZE (WxH) (Western Species)	SIZE (WxH) (Southern Pine)	BENDING (PSI) BALANCED DESIGN	SHEAR PARALLEL TO GRAIN (PSI)	COMPRESSION PERPENDICULAR TO GRAIN (PSI)	MODULUS OF ELASTICITY (PSI)
9"x7 ½"	9"x6 7/8"	1,600	165	560	1,400,000

Supplier may select individual laminates according to material availability and economy provided that these minimum design values are met. The combination symbol for the lay-up actually provided shall be stamped by the supplier on each timber at the center of both vertical faces.

All sizes are net-finished dimension; all pieces to be double-end trimmed (DET).

Western species material to be incised.

SPECIFICATION FOR GLUED LAMINATED SOFTWOOD TIMBER (C)

Glued laminated timber is to meet all provisions of *Standard Specifications for Structural Glued Laminated Timber of Softwood Species* (AITC 117, published by the American Institute of Timber Construction), latest revision. Timbers are intended for wet use conditions. Wet use adhesives conforming to *Structural Glued Laminated Timber* (ANSI/AITC A190), latest edition, shall be used.

Timbers shall be fabricated with zero camber. All laminates are to be wane free. All loose knots, unsound knots, and knotholes on the wide face of laminations exposed to view shall be filled with epoxy.

For 8” wide and narrower timbers, laminations shall all be one piece in width.

For wider timbers, exterior (top and bottom) laminates shall be one piece in width; or may consist of a maximum of two side-by-side edge bonded laminates. For interior layers, side-by-side laying of two laminates with maximum gap of 1/16" is acceptable. Joints shall be arranged such that the same joint position is not used in any of three successive layers and distances between joints in adjacent layers are maximized. Side-by-side laying of three or more laminates is not acceptable

Glued laminated timber shall be manufactured from western species or Southern Pine and shall be of balanced design.

Timber designated as structural bridge ties shall be manufactured with two tension laminates both top and bottom. These laminates shall be of the same species and grade. The outer laminates shall be considered sacrificial and shall be neglected in computation of design properties.

Lay-ups shall consist of grades of lumber which produce design properties equal to or exceeding the following when loaded perpendicular to the wide faces of the laminations. Representative sizes are given as information, but the intended function of the timber determines the required properties. These minimum design stress values are based on dry conditions.

FUNCTION, SIZE (WxH) (Western Species)	FUNCTION, SIZE (WxH) (Southern Pine)	BENDING (PSI) BALANCED DESIGN	SHEAR PARALLEL TO GRAIN (PSI)	COMPRESSION PERPENDICULAR TO GRAIN (PSI)	MODULUS OF ELASTICITY (PSI)
Stringers (Std), 6¾”x18" 8¾”x18”	Stringers (Std), 6¾”x17⅞" 8¾”x17⅞”	2,400	265	650	1,800,000
Caps, 14¼”x12” 14¼”x13½” 14¼”x14¼”	Caps, 14”x 12⅜” 14”x13¾”	2,000	265	650	1,600,000

Caps, 12¼"x 12" 12¼"x13½" 12¼"x14¼"	Caps, 12"x 12⅜" 12"x13¾"	2,000	265	650	1,600,000
Guard Timbers, 8¾"x4½"	Guard Timbers 8½"x4⅛"	1,500	195	375	1,300,000
Bridge Ties (Bearing), 8¾" x 7½" 8¾" x 8¼" 8¾" x 9" 10¾" x 7½" 10¾" x 8¼" 10¾" x 9"	Bridge Ties (Bearing), 8½" x 8¼" 10½" x 8¼"	1,600	215	560	1,400,000
Bridge Ties (Structural), 8¾ x Varies 10¾" x Varies	Bridge Ties (Structural), 8½" x Varies 10½" x Varies	2,400	265	650	1,800,000
Outlookers, 5⅛" x Varies	Outlookers, 5" or 5⅛" x Varies	2,400	265	650	1,800,000

Supplier may select individual laminates according to material availability and economy provided that these minimum design values are met. The combination symbol for the lay-up actually provided shall be stamped by the supplier on each timber at the center of both vertical faces. Combination symbol must be visible after treating and shall be between one and four inches in height.

All sizes are net-finished dimension; all pieces to be double-end trimmed (DET).

End-plating is not required for glued laminated timbers.

All material is to be incised.

All laminate timbers are to be loaded with the glue line/laminate oriented in a horizontal position. (Rev. 9-15)

All trucked material to have a pre-numbered shipping ticket accompanying each truck load, referencing UPRR purchase order number. Each truck to have adequate dunnage to allow forklift unloading – minimum 4" material.

BORATE TREATMENT GUIDELINES

UPRR prefers that ties be treated with borate as early as possible to minimize the impact of incipient decay.

1. SPECIES ELIGIBLE FOR BORATE TREATMENT (C)

White Oak, Red Oak, Hickory
Mixed Hardwoods as approved by UPRR
All ties to meet UPRR Grading Rules and Guidelines

Species are to be kept separated into the above listed groupings throughout the Borate treatment process, during drying, and through the Creosote treatment process.

2. BORATE TIE IDENTIFICATION (C)

Borate treated ties shall be clearly marked in a different manner than non-borate treated ties while in the supplier's facility. In addition, borate treated ties will be marked with an end plate or brand that clearly identifies that the tie is dual treated.

3. TIMBER PRETREATMENT CONDITIONS (C)

Moisture content at time of borate treatment is to be no less than: 70% for mixed hardwoods and 60% for oaks and hickories.

4. ACCEPTABLE BORATE TREATMENT METHODS (C)

The DOT (disodium octaborate tetrahydrate) must meet the AWPA Standard P25-10, be an EPA registered pesticide, and have a product label specifying its use in railroad ties.

(a) Pressure Cylinder (insulated and heated)
Results of treatment shall be a minimum net gauge retention of 0.25 PCF ± 5%.
(b) Dip Tank
Results of treatment shall be a minimum net gauge retention of 0.25 PCF ± 5%.

5. FOLLOWING BORATE TREATMENT - DIFFUSION (C)

After treatment with borate it is critical that proper diffusion be allowed to take place with ties covered in some manner: shed, chamber or stack cover. After initial diffusion ties shall be allowed to air-dry in the same manner as a standard creosote treated tie.
(a) Ties shall be transferred from borate treatment to diffusion storage as soon as possible.

(b) Transfer is not to occur in the rain unless ties are covered. Cover must be approved by UPRR. The key is to protect freshly treated borate ties from excessive moisture.

(c) Some manner of rainfall cover shall be present at the top of the stacks and of any stacks that are exposed to side rain, not covered by surrounding stacks.

(d) Ties shall be clearly marked to allow for easy determination of age.

6. FOLLOWING DIFFUSION (C)

After initial diffusion, ties shall be moved to an air drying yard and allowed to air dry similar to a non-borate treated green tie. Stacking method used at the facility is to meet UPRR Grading Rules and Guidelines. The following regiment shall be used to verify boron diffusion during air seasoning cycle.

1 month	2 months	3 months	6 months
3" borings	3" borings	3" borings	same
		3 cross sections	same

Borings and cross-sections to be taken from Red Oak, Sweetgum, and White Oak/Hickory ties from like stacks dipped on the same day.

Statistically, samples of 3 is the minimum to draw conclusions on.

Indicator solution used shall be circumin or AWPA- A3 part 17 deemed equivalent, and AWPA approved drying method used.

7. ARTIFICIAL SEASONING (C)

No borate treated cross or switch ties shall be boultonized.

8. CREOSOTE TREATMENT (C)

After seasoning and reaching the moisture content required in the UPRR standard crosstie specification, ties to be treated per UPRR Grading Rules and Guidelines as directed by UPRR. Creosote retention for dual treated ties to be 7 lbs. per cu. ft. up to +5% over optimum retention. Assay analysis methods A4, A6 and A65 shall be used at the discretion of UPRR.

MATERIAL HANDLING / TREATMENT GRADING RULES AND GUIDELINES AT TIMBER TREATING PLANT

1. YARDING (C)

A. All inbound truck material to be unloaded and segregated by supplier by size in an expeditious manner in the order which they arrive at the plant. Unloading hours to be as follows:

Denver, CO	7:00 A.M. - 3:00 P.M., Monday through Friday
Hope, AR	7:00 A.M. - 3:00 P.M., Monday through Friday
Little Rock, AR	7:00 A.M. - 3:00 P.M., Monday through Friday
The Dalles, OR	7:00 A.M. - 2:30 P.M., Monday through Friday

1) Material Manager-Ties shall be provided with an office equipped with heat, air conditioning, telephone, fax machine, desk, and chairs at the contractor's plant.

2) A competent contractor employee is to be assigned solely to resident Material Manager-Ties. Railroad reserves the right of refusal of any candidate or employee for this position. Clerk's work location to be as assigned by Material Manager-Ties.

B. All inbound material to be processed as required (double-end trimmed, graded, incised, end-plated and stacked for air drying) not to exceed 15 calendar days and purchase order quotas. All cars to be unloaded within five (5) calendar days unless other contractual arrangements are made. Railroad has the option to assess demurrage charges for cars exceeding these limits.

Suitable location will be provided for the inspection of all four sides and both ends of trimmed tie.

Supplier to provide documentation showing inspectors have successfully completed a crosstie grading seminar or equivalent industry training course.

(Rev. 9-15)

1) Grade ties to be double-end trimmed to 8' (+-3/4”) 8’6”(+-3/4”) or 9' (+-3/4”) as specified. Yard and Side Track Ties to be double-end trimmed to 8’6” (+ ¾ ”-2”). Graded according to Union Pacific Grading Rules and Guidelines contained herein.

2) After end trimming, rejected ties shall be segregated and additional milling not performed. Rejected ties will be stored in a separate location away from Union Pacific air drying ties.

3) All acceptable ties will be incised according to AREMA Manual for Railroad Engineering, Chapter 3-9.1.2, most recent revision. Incisor shall be equipped with cutting stamps to show year of yarding, treating location and ownership (UP) on the wide faces. The minimum dimensions of the incisor date on the stamp are: 1-11/16” long x 27/32” wide x ¼” deep.

4) Tie Identification - All ties to be processed with identification on the top of the tie within 20 inches of the center of the tie. Identification will include year processed, treatment type and plant. All characters to be easily visible while walking track. Before implementation, final design to be approved by Union Pacific.

   Year: 14, 15, etc.
   Treatment: C (Creosote) or BC (Borate Creosote)
   Plant: A (Alexandria), D (Denver), H (Hope), L (Little Rock), or T (The Dalles)
   Example: 14-BC-R

5) End Plate Material - All anti-split end plates to have rounded corners and a solid smooth perimeter. Embossed on all end plates will be “UP” and a location identifier (AX50 for Alexandria, DV50 for Denver, HP50 for Hope, NL50 for Little Rock, TD50 for The Dalles) followed by the Year such as “14”.

   All end plates to be manufactured from 18 gage galvanized steel, ASTM A653/A653 SS (structural steel) Grade 40 or better with an ultimate strength minimum of 55,000 psi and a yield strength minimum of 40,000 psi, glavanizing ASTM A653 G60 minimum coating, 4-5 teeth per square inch and 1/2 inch to 9/16 inch length of tooth.

   End-Plating Process – Each tie to be end plated will be mechanically squeezed to its original dimensions in such a fashion and sequence as to apply 30,000 lbs. (within the range of 29,000 to 31,000 lbs.) pressure on southern hardwoods and 26,000 lbs. (within the range of 25,000 to 27,000 lbs.) for west coast species. Pressures to be applied proportionally and on the entirety of all four tie surfaces before plate is pressed into the end. While in this pre-load condition, plates are to be pressed flush with the end of the tie and will be flush before leaving each plant. End plates to remain securely seated on the end of the tie and withstand rail vibrations.

   The intent is that no part of the end plate to be within 1/4" of any side surface. If any end end-plates extend over the edge of the tie, treating plant personnel are to hammer over these surfaces to eliminate any associated hazards.

   End Plates for 6"x8" ties to measure 5"x6"

   End Plates for 7"x9" ties to measure 6"x7" or 6 ¼” x 7"

   UP reserves the right to dictate brand of end plate to be used at each location.

Endplate Species Guidelines – 100% green tie end plating on the following species:

Ashes	Cypress	Larch	Sycamores
Beeches	Douglas Fir	Locust	Walnut
Birches	Elms	Maples(Hard)	
Cherries	Hickories	Oaks	

Selective Green Tie End Plating – Unless split is longer than 5'' or width is greater than 3/8''.

All other approved species: Gums, Pines and Western White Firs.

Selective Dry Tie End Plating and Treated Tie – End Plating Splits with lengths up to 10'' and widths up to ¾'' will be plated.

Dry Tie End-Plating and Treated Tie End Plating - Splits with lengths of up to 10" and widths up to 3/4" will be plated. Ties exceeding these requirements are to be segregated and kept away from grade material. The UP Material Manager-Ties will review before disposition.

Dry heart-checks that go into tie plate area will be rejected if the check is more than ¾" cumulative wide or if check causes plate area to be convex/concave where it would be unlikely to allow a flat surface for proper plate placement.

Any tie pulled out of process for heart-checks will be presented to Material Manager-Ties for final disposition.

All switchties to be end-plated.

Industrial, Yard and Side Track and Relay ties are not to be end plated except at the direction of the UP Material Manager Ties.

All end plates on crossties will be applied utilizing automatic feed system in such a manner as to not require any tacking or hammering of the plate.

No handling of ties which causes damage to end plates will be allowed.

6) Stacks of seasoning materials shall be supported on double treated skids, and in all cases there shall be at least 7" of open air space underneath the lower most layer of crossties. Crossties shall be stored in groups according to Oak/Hickory, Mixed Hardwood, Western Pine, Southern Yellow Pine, Douglas Fir/Larch, and Hem-Fir. Specie group, ownership (UP), length, date-stacked, run number and quantity shall be marked on each run. Storage stacks shall be placed no less than 2' apart, allowing a 4' alley between runs. Plants in arid areas are allowed exceptions to spacing requirements as agreed to by U.P. Material Manager Ties. Storage yard for seasoning shall be in the open where the air currents will circulate freely; it shall not be in a low area of high humidity; it shall have

good drainage, and shall be kept free from vegetation and debris, especially from wood already infected with decay. (Rev. 9-15)

2. SEASONING (C)

A. Moisture content will be determined by the 2" oven-dry method.

1) All Oak/Hickory ties will be seasoned for approximately ten months. At the direction of the Material Manager-Ties, moisture content will be taken. No Oak will be treated as dry if moisture content exceeds 45%.

2) All Mixed Hardwood ties will be seasoned for approximately five months. At the direction of the Material Manager-Ties, moisture content will be taken. No Mixed Hardwood will be treated as dry if moisture content exceeds 40%.

3) All Pine ties will season for approximately four months. At the direction of the Material Manager-Ties, moisture content will be taken. No Pine will be treated as dry if moisture content exceeds 30%.

4) All Douglas Fir/Larch will season for approximately seven months. At the direction of the Material Manager-Ties, moisture content will be taken. No Douglas Fir will be treated as dry if moisture content exceeds 30%.

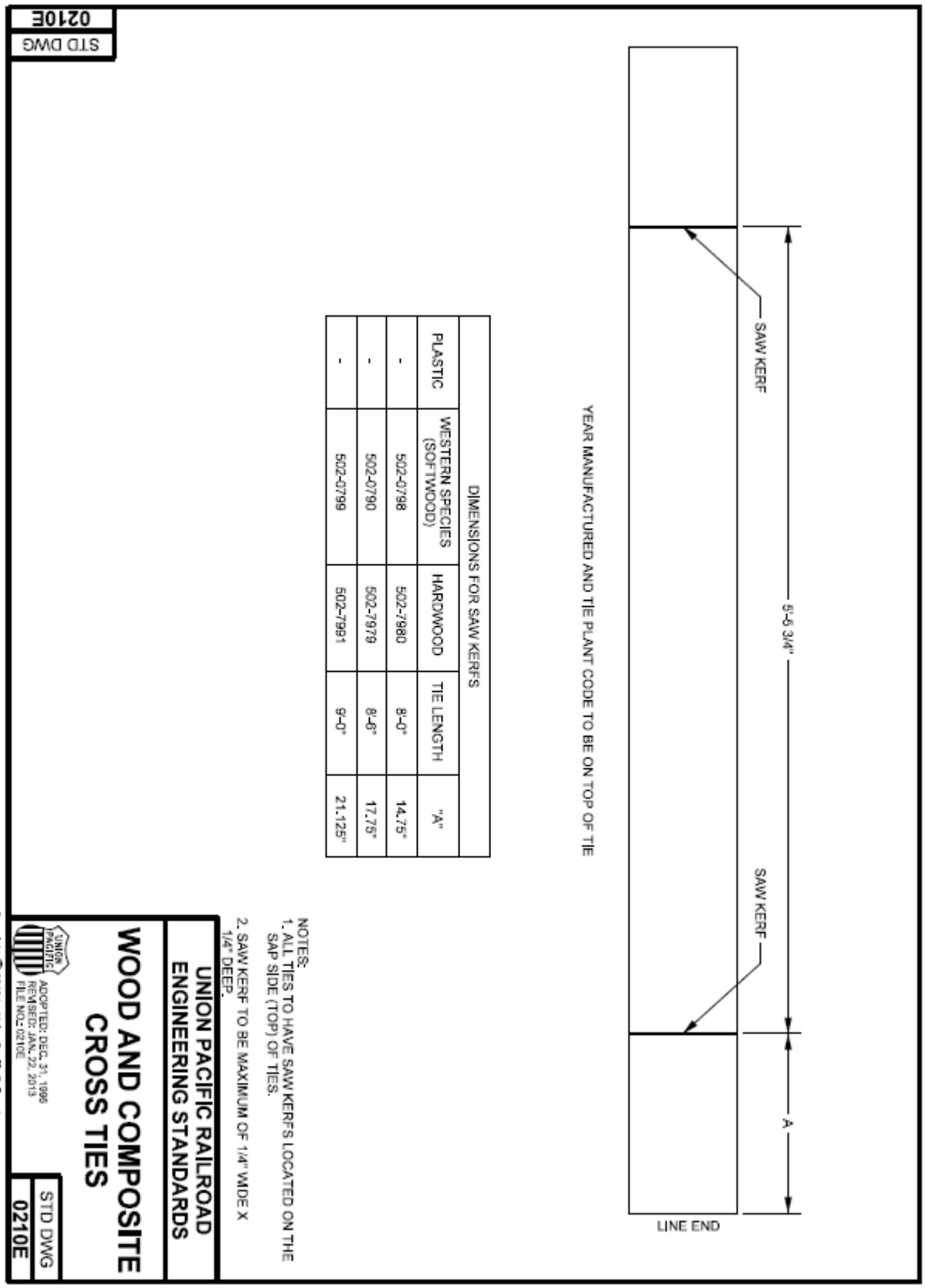
B. Material with moisture content above the listed targets to be treated per Section 7, Manner of Treatment - Green Material.

C. Straightness - No tie will deviate from straightness by more than 1" per lineal 9' section, prorated over the length of the tie and rounded to the nearest ½" along its length. Straightness will be measured from any edge of a tie to a straight line parallel to the edge of the tie. This will be true for the top to bottom of the tie, as well as from side to side of the tie.

D. Ties being used for premium turnouts are not to deviate from straightness by more than 1/2" over entire length of tie.

3. MILLING (C)

A. Saw Kerfs - The two (2) kerfs of sufficient depth to be easily visible and



discernible as saw kerfs. The saw kerfs will not be more than ¼" in depth and not

more than ¼" in width, per Std. Dwg. 0210D, or most recent revision.

B. Stacking on Trams - Tram for treatment. Stickers are required for Boulton treatment as detailed (see Section 7).

4. **TREATMENT (C)**

All material to be sterilized during the treatment process.

INDUSTRIAL TIES:

All industrial ties will be processed and treated as directed by UPRR Material Manager-Ties. Ties to be treated per treating location specifications, loose loaded and shipped at railroad's direction. Retention to be 7 lbs. per cu. ft. of preservative or refusal.

ALL TIES:

All treatment to meet AWPA Book of Standards, Most Recent Revision, as set forth by the American Wood Protection Association (AWPA) and the following guidelines:

A. Treating reports should be accurately completed for all charges. Each report shall contain the following information:

(1) Charge number.
(2) Date.
(3) Species - size-quantity.
(4) Total retort time in hours.
(5) Conditioning time in hours.
(6) Pressing time in hours.
(7) Retention in lbs. per cu. ft.
(8) Initial air time, if applicable.
(9) Gauge reading and times.
(10) Treating operator's signature or initials.
(11) Seasoned condition - green or dry.
If green, include:
(a) Initial moisture content.
(b) Target: Water removal.
(c) Actual: Water removed.
(12) Final vacuum.
(13) Weight of preservative solution at 100°F.
(14) Work tank number and cylinder number.
(15) A graph showing all treating activities is to be included (initial air, temperature, pressure, vacuum as a function over time)

B. The preservative shall be P-2 solution per AWPA P2-09, latest revision, for all

plants.

C. At the railroad's discretion, a preservative mixture shall consist of a mixture of 50% by volume of creosote oil conforming to P1/P13-09 and 50% by volume of residuum oil complying with P4-11. The creosote and oil to be thoroughly mixed in the working tank until the mixture is of uniform composition per AWPA Standard P3-09.

D. Other treatments may be allowed as approved individually by Union Pacific.

5. PLANT EQUIPMENT (C)

All pressure, temperature, vacuum, and work tank volume gauges and charts should be in proper working order and be calibrated by an outside concern once a year, or sooner if requested by the railroad. Letter of calibration should be on file at the respective timber treating plant. It will be required that pressure, temperature, vacuum, and work tank volume be recorded on a chart as a function of time. Treating plants shall be equipped with thermometers and gauges necessary to indicate and record accurately the conditions at all stages of treatment, and all equipment shall be maintained in an acceptable working condition per AWPA Standard M3-13, Parts A and B, Section 3 most recent revision. The work tank temperature should never drop below 170°F. Water removed during Boultonizing is to be recorded as a function of time on the same chart as all other charge information.

6. MANNER OF TREATMENT - AIR-DRIED TIES (M)

Payment will be made only for the amount of preservative solution actually retained up to 5% over optimum retention of 7 lbs. per cu. ft. or 8 lbs. per cu. ft. Any spillage or leakage of preservative solution in the treating system is to be calculated and credited to the appropriate charge with final retention adjusted accordingly. Charge reports showing more than 7.35 lbs. per cu. ft. for 7 pound charges; or 8.4 lbs. per cu. ft. for 8 pound charges; or 10.5 lbs per cu. ft. for bridge lumber (retention) require resident Material Manager-Ties' approval before invoicing.

Material Manager-Ties to direct targeted retention level per charge.

Charges failing to meet all the treating grading rules and guidelines indicated below should be reviewed by the Material Manager-Ties before shipment. If the Material Manager-Ties determines the treatment to be inadequate, the charge will be retreated per the Material Manager-Ties' instructions. Preservative used during retreatment will be paid for by the Union Pacific. All expenses incurred will be absorbed by the contractor. The Material Manager-Ties will review the retreated charge before shipment. Any spillage or leakage of preservative in the treating system is to be calculated and credited to the appropriate charge with final

retention adjusted accordingly.

For all other approved species, if wet (Oak >45%, Hardwood>40%, Southern Yellow Pine >30%, Western Pine >30%, Douglas Fir & Larch >30%, Western Hem-Fir >30%) and only at the direction of the Union Pacific Material Manager – Ties, may be Boultonized to remove excess moisture before preservative treatment, per Boultonizing paragraph included in Section 7.

A. Oak/Hickory - Treat with a Lowry empty-cell process without initial air pressure. Preservative is introduced into the cylinder, completely filling the retort. Minimal temperature of 180°F will be attained before the pressure cycle begins. During the pressure period, the preservative temperature shall always be in the range of 180° to 210°F. The pressure period will be held for a minimum of 4 (four) hours. During the pressure cycle, if retort temperature falls below 180°F and/or retort pressure falls below 170 PSI, this time will not count toward the total press time. All oak to be treated to a minimum targeted retention of 7 or 8 lbs. per cu. ft. or refusal. Refusal defined as being when the quantity of preservative absorbed in each of any two consecutive half hours is not more than 2% already injected. Oak and mixed hardwood ties treated to less than 8 lbs. per cu. ft. net retention are to be segregated by retention from the 8 lbs. per cu. ft. or higher retention ties.

   During the pressure period, the optimum pressure should be 200 PSI with pressure never falling below 170 PSI. After blow-back, final vacuum should not be less than 22" of mercury for one hour. After vacuum, the drippings are pumped back to the work tank for final calculations of preservative retention by charge.

B. Hardwood - Treat with a Rueping empty-cell process with initial air. After attainment of desired initial air, preservative solution is introduced into the cylinder, completely filling the retort. Minimal temperature 180°F will be obtained before the pressure period begins. During the pressure period, the solution temperature shall always be in the range of 180° to 210°F. The pressure period will be held for a minimum of 3 hours. During the pressure cycle if retort temperature falls below 180°F and/or retort pressure falls below 170 PSI, this time will not count toward the total press time. All mixed hardwood to be treated to a targeted retention of 7 or 8 lbs. per cu. ft. or refusal. During the pressure period, the optimum pressure should be 200 PSI with pressure never falling below 170 PSI After blow-back, final vacuum should not be less than 22" of mercury for one hour. After vacuum, the drippings are pumped back to the work tank for final calculations of preservative retention by charge.

C. Southern Pine - Southern Yellow Pine is considered "dry" at or below moisture content of 30%.

   If dry, treat Southern Yellow Pine with a Rueping empty-cell process with

initial air of 60-70 lbs. After attainment of desired initial air pressure, preservative solution is introduced into the cylinder, completely filling the retort, and without losing the desired level of initial air. Minimal temperature of 180°F will be attained before the pressure period begins. During the pressure period, the preservative solution temperature should always be in the range of 180°F to 210°F. Optimum pressure is within a 150 PSI to 180 PSI range. All Southern Pine to be treated to a targeted retention of 7 lbs. per cu. ft. retention or refusal. Total time in hot oil to be a minimum of 5 hours. After blow-back, final vacuum should not be less than 22" of mercury for one hour. After vacuum, the drippings are pumped back to the work tank for final calculations of preservative retention by charge.

D. Western Pine - Treat with a Lowry empty cell process without initial air pressure. Preservative is introduced into the cylinder, completely filling the retort. A minimum treating temperature of 180° F will be attained before the pressure period begins. During the pressure period, the solution temperature should always be in the range of 180-210°F. During the pressure cycle, if the temperature falls below 180° F, the time will not count toward the total cylinder time. During the pressure period, the optimum pressure should be 180 PSI and must be held long enough to attain a minimum 7 lbs. per cu. ft. net retention. After releasing pressure, increase charge temperature from 180° F to 210° F as quickly as possible. Hold at 210° F for two hours. After blowing back preservative to the work tank, a vacuum of not less than 22" mercury shall be held for two hours. After final vacuum, the drippings are pumped back to the work tank for final calculations of preservative retention by charge.

E. Douglas Fir and Larch - Treat Douglas Fir and Larch with a Lowry empty-cell process without initial air pressure. Preservative is introduced into the cylinder, completely filling the retort. A minimum treating temperature of 180°F will be attained before the pressure period begins. During the pressure period, maintain temperature of 180-190°F. Optimum pressure is within a 150 PSI to 180 PSI range and must be held long enough to attain a targeted 7 lbs. per cu. ft net retention, refusal of additional oil absorption, or for a maximum pressure period of 8 hours, whichever occurs first. Refusal defined as being when the quantity of preservative absorbed in each of any two consecutive half hours is not more than 2% already injected. After releasing pressure, hold material in an expansion bath for two hours. During this expansion bath, increase temperature from 190 to 210°F as quickly as possible. After blow-back, a vacuum of not less than 22" of mercury shall be held for two hours. After final vacuum, the drippings are pumped back to the work tank for final calculations of preservative net retention by charge.

F. Western Hem-Fir is considered "dry" at or below moisture content of 30%.

If dry, treat Hem-Fir with a Lowry empty cell process without initial air pressure. Preservative is introduced into the cylinder, completely filling the

retort. A minimum treating temperature of 180°F will be attained before the pressure period begins. During the pressure period, maintain temperature of 180-190°F. Optimum pressure is within a 150 PSI to 180 PSI range and must be held long enough to attain a targeted 7 lbs. per cu. ft. net retention or refusal. Refusal defined as being when the quantity of preservative absorbed in each of any two consecutive half hours, is not more than 2% already injected. After releasing pressure, hold material in an expansion bath for two hours. During this expansion bath, increase temperature from 190-210°F as quickly as possible. After blow-back, a vacuum of not less than 22" of mercury shall be held for two hours. After final vacuum, the drippings are pumped back to the work tank for final calculations of preservative net retention by charge.

Final readings for all treatment to be entered on the treating report. Treating report and charts become a permanent record maintained by the treating company with open access to railroad personnel.

7. MANNER OF TREATMENT - GREEN MATERIAL (M)

Under the direction of the Material Manager-Ties, material with a moisture content exceeding grading rules and guidelines herein provided shall undergo the Boulton drying process prior to treatment.

Material will be separated by two 3/8”(minimum thickness) stickers between each layer of trammed ties.

Before placing material in the treating cylinder, 2" increment borings for each charge (minimum sampling size - 1% per charge) will be taken and the moisture content will be determined by the toluene extraction or oven-drying method, as approved by the Material Manager-Ties. Borings will be used to determine a water removal target to be extracted from the material before the pressure period begins. Quantity of water to be removed must be recorded on permanent charge records.

A. BOULTON DRYING PROCESS

Material is put into the treating cylinder. The preservative is introduced, completely covering the material but not totally filling the cylinder. A minimum 8" head space will be left between the top of the cylinder and the preservative. Boulton process is to conform to AWPA T1-13 Section 1, 1.4.5, most recent version. Maximum moisture content to be 45% Oak, 40% Mixed Hardwood, 30% Douglas Fir, Hem-Fir and Pine before pressure cycle begins.

Boultonizing vacuum is to be in the range of 12" - 24" with the indicated corresponding temperature as per AWPA Factors 6, Table 1 of the AWPA Manual so as to maximize rate of water removal. Desired Boultonizing

temperature to be in a range from 170°F to 190°F. Do not exceed 190°F.

Water coming out of the material will go through a condenser and be measured to determine effectiveness of the process (removal rates) and total water quantity removed. Process shall continue until sufficient moisture has been removed to allow proper treatment and/or the charge refuses to give up additional water. Refusal defined as either: (1) when the quantity of water removed in each of any two consecutive half hours is not more than 2% that already removed, or (2) at any time during removal of the last half of the moisture target, any two consecutive half hour's result in a rate of removal of less than 20 gallons per hour.

Quantity of water actually removed must be recorded on permanent charge records.

B. STEAMING PROCESS - PINE

Steaming will be permitted on Pine material exceeding the moisture content levels previously mentioned. Steaming process is to conform to AWPA T1-13, Section 1, 1.4.3, most recent revision. After the material is in the cylinder, live steam will be introduced bringing the cylinder temperature to 240°F. This process to take a minimum of one hour. Condensate will collect in the bottom of the cylinder and will periodically be emptied. Steaming to continue for 13 - 17 hours, depending on the size of material being steamed. After the steaming cycle is complete, a 22" vacuum will be attained and held for a minimum of three hours. All water which accumulates during the vacuum period will be emptied before the treating cycle begins.

8. BORINGS - PENETRATION (C)

Penetration of preservative solution shall be determined by boring not less than 10 ties per charge. Holes that may be bored shall be filled with tight-fitting treated plugs per AWPA, T1-13 Section 3.1 and M2-11, Section 4.2.3. Penetration to meet AWPA Standards, Section 4.3 latest revision. Borings to be on the narrow face, taken in a random manner away from surface checking, cracks, and incising holes in the center of the tie perpendicular to the long axis. All borings to be furnished to Material Manager-Ties or designated representative who through visual analysis of borings and review of treating records determines acceptability of treatment. Borings to be retained at treating facilities for a minimum of 90 days. At determination of the Material Manager - Ties, Assays of products may be required to confirm treatment results and are to be processed in conformance with AWPA T1-12 Section C.

9. CARE OF TREATED WOOD (C)

Extreme care should be used in handling treated material to avoid damage to the

edges of the timbers or breaking through the treated portions and exposing untreated wood. The use of peavies, canthooks, pickaroons, log hooks, or other pointed tools, shall be such as not to break through the treated portion of the wood nor damage end plates. If damage occurs during handling which could potentially impair the longevity of material service life, this material will be retreated or replaced at the contractor's expense. All costs of retreatment, including preservative or re-endplating, to be absorbed by the contractor. Maximum effort is to be made to have cars ready for loading when treated material is ready to ship.

10. BANDING (M)

All stickers to be removed from Boulton charges prior to banding or shipment.

Forest products are to be banded only at the direction of the Material Manager-Ties.

All banded ties are to be secured using 2 clips per crimp joint. Banding to be in compliance with AAR Section No. 1 para. 17 using 1 ¼" x .044 (or greater) steel banding – non-metallic strapping not allowed.

Standard crosstie bundle size is 15 pieces (5 wide by 3 high) or as directed by UPRR Material Manager-Ties.

Standard switchtie bundle size is 10 pieces (5 wide by 2 high) or as directed by UPRR Material Manager-Ties.

11. LOADING (C)

All material to meet straightness requirements as set forth in this document.

Material to be loaded securely in gondolas or on flat cars suitable for grapple, fork lift or cable unloading in accordance with railroad shipping requirements. Shipment to be made in Union Pacific supplied railroad cars to the maximum extent possible, and cars will be loaded to the practical maximum capacity. Dunnage, used between bundles, is to be a minimum 2" nominal thickness and consist of 2 per crosstie bundle. Cars must be loaded so that no part of any tie protrudes above the top chord (sidewalls) of the car. We should be able to strike a rod or string line across a car's top chords, and not contact any tie. Each supplier is responsible to ensure that cars are not loaded beyond AAR capacity limit and in compliance with AAR Rules For Safe Handling And Transportation Of Material.

When loading ties loose into gondolas, all bands are to be removed from car.

All treated ties loaded in open top gondola cars are to have a paint stripe along the entire top layer of ties of each car. Paint used is to be of a metallic base, or of a grade that will withstand extended exposure to creosote without fading.

Truck loading hours to be the same as inbound unloading hours as listed on herein, except in the case of after hours emergency shipments which may occur at anytime.

12. INVOICING (M)

Supplier to provide one invoice(s) at the end of each calendar month covering all applicable treating and handling charges for that calendar month. Contractor to itemize each service and cost as a separate item on invoice. The number of gallons of preservative used will be shown as a separate item on the invoice. Supplier to provide invoice(s) to resident Material Manager-Ties at the applicable treating plant.

COPPER NAPHTHENATE TREATMENT GUIDELINES

1. TREATMENT (C)

(a) Treatment shall be by the empty cell method with a copper naphthenate solution in accordance with AWPA Standard P-36, and adhere to the standard quality control procedures AWPA M3-15.
(b) The preservative solution shall be tested monthly according to AWPA Standard A-9, A-21 or A-88
(c) Pressure periods for kiln, boulton, and steam & vacuum dried materials will include only the time at 130 psi or more, and will be sufficient to meet desired retentions. A temperature of 130-190°F must be maintained throughout the pressure cycle.

2. PARAMETERS (C)

(a) Treatment shall comprise a minimum 130 psi pressure but not exceeding 200 psi.
(b) The target gross solution uptake should be ~ 8 lbs/ft^3 (pcf) by gauge during the pressure cycle, and net solution retention after final vacuum shall be not less than 5 pcf.
(c) Net copper retention shall be not less than 0.06 pcf.
(d) A final vacuum of not less than 22" of mercury shall be applied and maintained for not less than 2 hours, until the wood is free of dripping preservative when removed from the cylinder.

3. BORINGS - PENETRATION (C)

Penetration of preservative solution shall be determined by boring not less than 10 ties per charge. Holes that may be bored shall be filled with tight-fitting treated plugs per AWPA, T1-13 Section 3.1 and M2-11, Section 4.2.3. Penetration to meet AWPA Standards, Section 4.3 latest revision. Borings to be on the narrow face, taken in a random manner away from surface checking, cracks, and incising holes in the center of the tie perpendicular to the long axis. All borings to be furnished to Material Manager-Ties or designated representative who through visual analysis of borings and review of treating records determines acceptability of treatment. Borings to be retained at treating facilities for a minimum of 90 days. At determination of the Material Manager - Ties, Assays of products may be required to confirm treatment results and are to be processed in conformance with AWPA T1-12 Section C.

LINE POLES -
SOUTHERN YELLOW PINE AND DOUGLAS FIR

GREEN GRADING RULES AND GUIDELINES (M)

Poles to meet standards as put forth in ANSI Grading Rules and Guidelines and Dimensions for Wood Poles, latest revision. Poles to be freshly cut (Douglas Fir Poles to be incised full length), not older than six months and clean peeled. Each individual pole must meet all ANSI grading rules and guidelines. Poles shipped on flat cars, gondolas or trucks must be loaded for safe handling and transportation. Poles to be branded 10' from bottom of each pole showing the following information on the face of the pole (the gain side):

1. Producer's identification symbol
2. Date
3. Class
4. Length

INSPECTION

Line poles will be inspected twice at FOB point of origin before shipment. Poles will be initially inspected before any framing. Poles will be inspected again after framing, but before shipment. Union Pacific Material Manager-Ties will have authority to reject any pole.

All framing to be done according to Union Pacific Signal Department Drawing A-333, latest revision. For carload shipments, please ask for, and load in Union Pacific equipment, if available, to full capacity as far as practical. Poles must be segregated for inspection and loaded in car(s) by class, length, and framing. Adequate blocking must be used to separate the various poles according to the variables of class, length, and framing.

Any reject line poles shipped to a timber treating plant will be set aside for supplier disposition. If written advice is not received from the supplier within 30 days after receipt of reject line poles, they will be disposed of at the railroad's discretion.

Poles loaded on railcars to be in compliance with AAR Rules For Safe Handling And Transportation Of Material.

LINE POLES -
SOUTHERN YELLOW PINE AND DOUGLAS FIR – CREOSOTE TREATMENT

All treatment to AWPA Book of Standards and the following guidelines. Preservative to comply with AWPA P2-09. Any spillage or leakage of preservative in the treating system is to be calculated and credited to the appropriate charge with final retention adjusted accordingly. After vacuum, the drippings are pumped back to the work tank for final calculation of preservative retention by charge.

SOUTHERN YELLOW PINE

All treatment to AWPA Book of Standards as set forth by the American Wood Protection Association and the following guidelines.

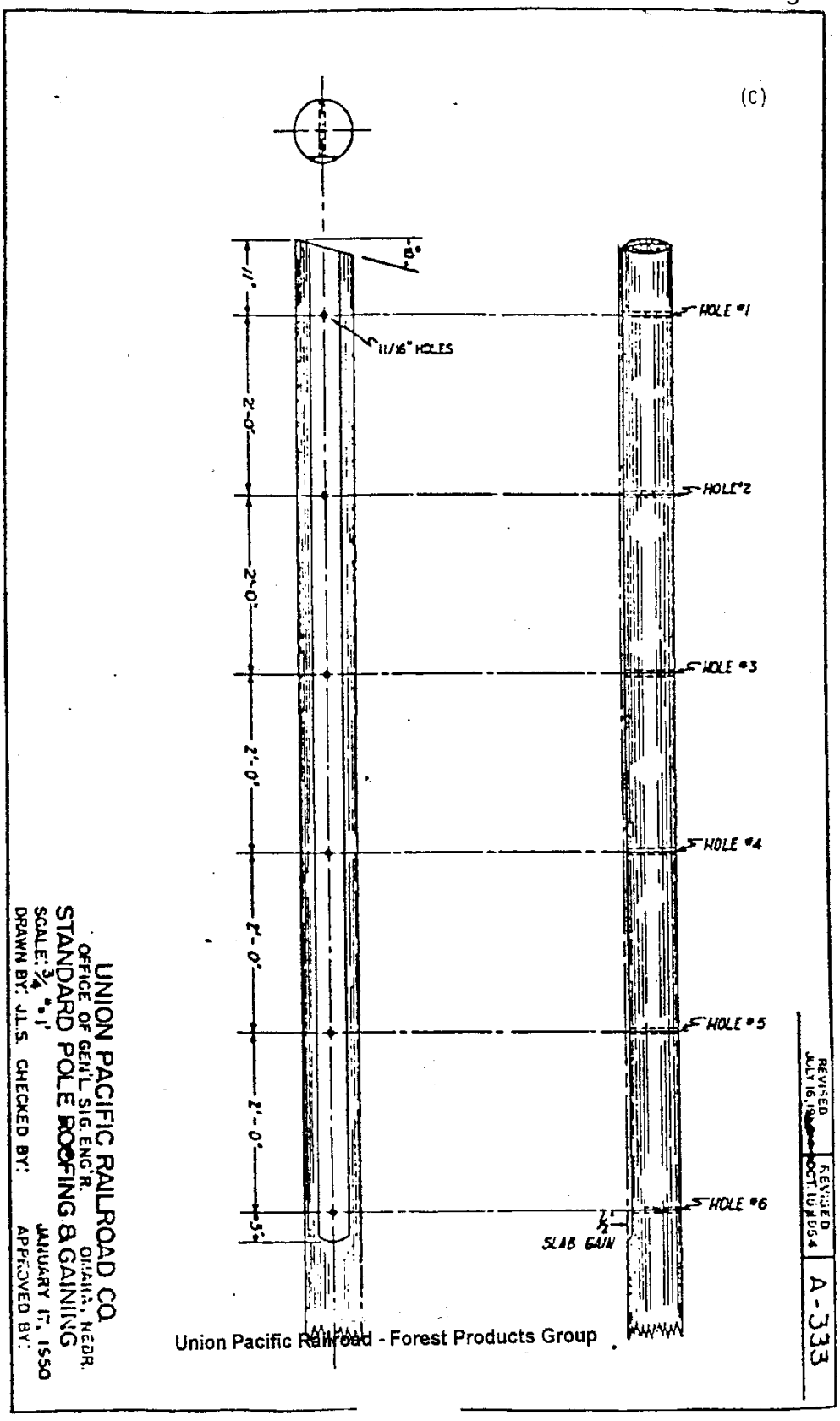
Treat with a Rueping empty cell process with initial air of 40-50 lbs. After attainment of the required initial air pressure, preservative is introduced into the cylinder completely filling the retort. Minimal temperature of 180°F will be attained before the pressure period begins. During the pressure period, the preservative temperature should always be in the range of 180° to 210°F. All pine poles are to be treated to a minimum retention of 10 lbs. per cu. ft. with a minimum pressure period of two hours. During the pressure period, the optimum pressure should be 180 PSI with the pressure never falling below 150 PSI. After blow-back, final vacuum should not be less than 22" of mercury for an hour.

DOUGLAS FIR

Treat with a Lowry empty-cell process without initial air. Preservative is introduced into the cylinder, completely filling the retort. A minimum treating temperature of 180°F will be attained before the pressure period begins. During the pressure period, maintain temperature of 180°-190°F. To be treated to a minimum retention of 10 lbs. Per cu. Ft., or refusal. Refusal defined as being when the quantity of preservative absorbed in each of any two consecutive half hours is not more than 2% already injected. During the pressure period, pressure should be held at a minimum 120 PSI (not exceeding 150 PSI) for a minimum of 2-1/2 hours. During the pressure cycle, if retort temperature falls below 180°F and/or retort pressure falls below 120 PSI, this time will not count toward the total pressure time. After releasing pressure, increase the charge temperature from 180°-190°F to 210°F as quickly as possible. Hold at 210°F for two hours. After blow-back, a vacuum of not less than 22" of mercury shall be held for two hours.

Charges failing to meet all the above treating grading rules and guidelines should be reviewed by the Material Manager-Ties or designated representative before shipment. If the Material Manager-Ties determines the treatment to be inadequate, the charge will be retreated per the Material Manager-Ties' instructions. Preservative used during the retreatment will be paid for by the railroad. All other expenses will be absorbed by the contractor. Material Manager-Ties or designated representative will review the retreated charge before shipment.

Final readings to be entered on the treating report. Treating report and charts become a permanent record maintained by the treating company with open access to railroad personnel. Reference Penta Treated Lumber/Poles contained herein.



PILING -

September 11, 2015
Union Pacific Railroad – Forest Products Group

SOUTHERN YELLOW PINE AND DOUGLAS FIR –

GREEN GRADING RULES AND GUIDELINES (M)

ASTM grading rules and guidelines and the following requirements:

1. All piling must be manufactured from straight, sound, live timber, free from cracks, shakes, splits or rotten knots and free from twist in excess of 1/2 the circumference in the length of the pile. Douglas Fir piling to be incised full length.

2. All piling for treatment shall be entirely cleaned of both inner and outer bark, and shall have not less than 1” sap wood on the butt ends.

3. All piling must be so straight that a line drawn from the center of one end of pile to center of other end, will show the pile to be at no point over 1/2 of its average diameter out of a straight line.

4. Piling must be cut above ground swell and must show an even gradual taper from end to end. Ends must be cut square, all bark removed, branches and knots trimmed off smooth, finishing the pile in a workmanlike manner.

5. Piling will be accepted on the above grading rules and guidelines at point of shipment or destination as agreed.

6. The railroad will not be responsible for rejected piling left on treating plant premises.

All piling will have minimum diameter of 14" at 3' from butt with:

10" Tip (25' - 45')
9" Tip (50' - 55')
8" Tip (60' - 65')
7" Tip (70' - 85')

PILING -
SOUTHERN YELLOW PINE AND DOUGLAS FIR - TREATMENT (M)

All treatment to AWPA Book of Standards and the following guidelines:

Any spillage or leakage of preservative in the treating system is to be calculated and credited to the appropriate charge with final retention adjusted accordingly. After vacuum, the drippings are pumped back to the work tank for final calculation of preservative retention by charge.

PRESERVATIVE

The preservative shall consist of coal tar creosote conforming to AWPA Book of Standards P2-09, latest revision.

Charges failing to meet the following treating requirements for Southern Yellow Pine or Douglas Fir should be reviewed by the Material Manager-Ties or designated representative before shipment. If the Material Manager-Ties determines the treatment to be inadequate, the charge will be retreated per the Material Manager-Ties' instructions or designated representative. Preservative used during the retreatment will be paid for by the railroad. All expenses incurred will be absorbed by the contractor.

Final readings are to be entered on the treating report. Treating report and charts become a permanent record maintained by the treating company with open access to Railroad personnel.

Penetration of preservative shall be determined by boring a minimum of ten (10) piles per charge. Holes which are bored are to be filled with tight-fitting treated plugs per AWPA Standard T1-13, Section 3.1. Penetration to meet AWPA Book of Standards T1-13, Section 3.3. All borings to be furnished to the Material Manager-Ties who through visual analysis of borings and review of treating records determines acceptability of treatment.

SOUTHERN YELLOW PINE

Treat with a Rueping empty cell process with initial air of 20-30 lbs. After attainment of the required initial air pressure, preservative is introduced into the cylinder completely filling the retort. Minimal temperature of 180° F will be attained before the pressure period begins. During the pressure period, the preservative temperature should always be in the range of 180° F to 210° F. All pine piling is to be treated to a minimum retention of 16 lbs. per cu. ft. with a minimum pressure period of four hours. During the pressure period, the optimum pressure should be 180 PSI with the pressure never falling below 150 PSI. After blow-back, final vacuum should not be less than 22" of mercury for an hour. For marine (salt water) use, pine piles are to be treated with a Lowry empty-cell process without initial air and treated to a minimum net retention of 20 lbs. per cu. ft. Temperatures, pressures and final vacuum are same as above.

DOUGLAS FIR

Treat with a Bethel full-cell process using an initial vacuum of 22" of mercury which should be held for not less than 30 minutes before the cylinder is filled with preservative. Preservative is introduced into the cylinder completely filling the retort without admitting air. A minimum treating temperature of 180° F will be attained before the pressure period begins. During the pressure period, maintain temperature of 180° -190° F. During the pressure period, pressure should be held at a minimum of 120 PSI. (not exceeding 150 PSI) for a minimum of 2-1/2 hours. Fresh water foundation piles to be treated to a minimum net retention of 16 lbs. per cu. ft. or refusal. Refusal defined as being when the quantity of preservative absorbed in each of any two consecutive half hours is not more than 2% already injected. After releasing pressure, increase charge temperature from 180° -190° F to 210° F as quickly as possible. Hold at 210°F for two hours. After blow-back, a vacuum of not less than 22" of mercury shall be held for two hours.

For marine (salt water) use, Douglas Fir piles are to be treated as above with the exception that net final retention is to be 20 lbs. per cu. ft. or refusal.

TIMBERS AND LUMBER GRADING RULES AND GUIDELINES
SOUTHERN YELLOW PINE AND DOUGLAS FIR -

GREEN GRADING RULES AND GUIDELINES (C)

Material to be sawn from sound, straight, live timber, free from any defect that might impair durability or strength. Will not accept multiples or combinations. To be cut square at the ends and have all bark that impairs treatability entirely removed. DET to indicated lengths on Purchase Order.

All Southern Yellow Pine lumber to be full sawn and produced according to Southern Pine Inspection Bureau (SPIB) Standard Grading Rules for Southern Pine Lumber, latest revision.

All Coastal Douglas Fir lumber to be produced according to West Coast Lumber Inspection Bureau (WCLIB) Grading Rules, latest revision. All material to be end sealed with wax base end sealant fully covering all end surfaces. All stringers are ordered select structural, 100% FOHC (8"x16", 8"x17"). All other select structural are boxed heart. All No. 1 timbers are boxed heart. Upon inspection at destination, lumber must be full sawn to the maximum dimensions as defined in paragraph 250-a, WCLIB, latest revision for both thickness and width.

Individual lumber items will be graded according to U.P. Grading Rules and Guidelines. No off-grade material will be accepted.

TIMBER AND LUMBER MATERIAL HANDLING / TREATMENT
SOUTHERN YELLOW PINE, DOUGLAS FIR, AND
GLUED LAMINATED SOFTWOOD TIMBER - TREATMENT (M)

All treatment shall be per AWPA *Book of Standards* and the following guidelines:

Solid sawn material will be separated by two 3/8" (minimum thickness) stickers between each layer of material before treatment. All framing must be completed before material is treated.

Before placing solid sawn material in the treating cylinder, 2" increment borings for each charge (minimum sample size – 1% per charge) will be taken and the moisture content will be determined by the toluene extraction or oven drying method as approved by the UPRR Material Manager-Ties. Borings will be used to determine a water removal target to be extracted from the material before the pressure period begins. Quantity of water to be removed must be recorded on permanent charge records.

Any spillage or leakage of preservative in the treating system is to be calculated and credited to the appropriate charge with final retention adjusted accordingly. After vacuum, the drippings are pumped back to the work tank for final calculation of preservative retention by charge.

GLUED LAMINATED SOFTWOOD TIMBER

Treatment shall conform to provisions of *Standard for Preservative Treatment of Structural Glued Laminated Timber* (AITC 109), latest revision, and all other provisions of this specification.

SOUTHERN YELLOW PINE

The preservative shall be P2 solution per AWPA P2-09, latest revision.

Treat with a Rueping empty-cell process with initial air of 60-70 lbs. After attainment of desired initial air, preservative is introduced into the cylinder, completely filling the retort. Minimal temperature of 180°F will be attained before the pressure period begins. During the pressure period, the solution temperature should always be in the range of 180° to 210° F. All pine to be treated to a minimum retention of 10 lbs. per cu. ft. with a minimum pressure period of two hours. During the pressure period, the optimum pressure should be 180 PSI with pressure never falling below 150 PSI. After blow-back, final vacuum should not be less than 22" of mercury for one hour.

DOUGLAS FIR

The preservative shall be P2 solution per AWPA P2-09, latest revision.

Timber and lumber to be treated with a Lowry empty-cell process without initial air pressure. Preservative is introduced into the cylinder, completely filling the retort. A minimum treating temperature of 180°F will be attained before the pressure period begins. During the pressure period, maintain temperature of 180° -190° F. Timber and

lumber to be treated to a net retention of 8 lbs. per cu. ft. or refusal. Refusal defined as when the quantity of preservative absorbed in each of any two consecutive half hours is not more than 2% already injected. During the pressure period, pressure should be held at a minimum 120 PSI (not exceeding 150 PSI) and the temperature is to be 180° -190° F. Pressure period is to be a minimum of 2-1/2 hours. During the pressure cycle, if temperature falls below 180°F and/or retort pressure falls below 120 PSI, this time will not count toward the total pressure time. After releasing pressure, increase the charge temperature from 180° /190° F to 210° F as quickly as possible. Hold at 210° F for two hours. After blow-back, a vacuum of not less than 22" of mercury shall be held for two hours.

Any spillage or leakage of preservative solution in the treating system is to be calculated and credited to the appropriate charge with final retention adjusted accordingly.

Charges failing to meet all of the above treating grading rules and guidelines should be reviewed by the Material Manager-Ties or designated representative before shipment. If the Material Manager-Ties determines treatment to be inadequate, the charge will be retreated per the Material Manager-Ties' instructions or designated representative. Preservative used during retreatment will be paid for by the railroad. All other expenses incurred will be absorbed by the contractor. Material Manager-Ties is to review any retreated charge before shipment.

Final readings are to be entered on the treating report. Treating report and charts become a permanent record maintained by the treating company with open access to railroad personnel.

Penetration of preservative shall be determined by boring a minimum of ten (10) borings per charge. Holes which are bored are to be filled with tight-fitting treated plugs per AWPA Book of Standards T1-13, Section 3.1. Penetration to meet AWPA Standards T1-13, Section 4.3. All borings to be furnished to the Material Manager-Ties or designated representative who, through visual analysis of borings and review of treating records, determines acceptability of treatment.

PENTA TREATED LUMBER/POLES

Treatment Grading Rules and Guidelines (C)

All treatment to AWPA Book of Standards and the following guidelines:

PENTA PRESERVATIVE

Preservative solution shall consist of Pentachlorophenol and an oil carrier conforming to AWPA Book of Standards P8-11 and P9-10; latest revision. In solution, Pentachlorophenol concentration to be between 5% - 9% by weight with optimum range of 7% - 8%. Concentration of solutions to be tested in laboratory at least twice each week and adjusted as required to stay within the 5% - 9% range.

TREATMENT

Treat with Rueping, empty-celled process with initial air of 40-60 lbs. After attainment of required initial air pressure, preservative solution is introduced into the cylinder until it is completely filled. Lumber to be treated to a 10 lbs. per cu. ft. retention with a 5% penta solution or its equivalent, unless otherwise requested. Poles to be treated to a 10 lbs. per cu. ft. retention with a 5% penta solution or its equivalent, unless otherwise requested. Minimal temperature of 140°F will be attained before pressure period begins. During the pressure period, preservative temperature should always be between 140-160°F. Pressure of 150-180 PSI to be held for a minimum of one hour or until an adequate gross retention has been reached which will give the necessary assay results. After the pressure cycle ends, the cylinder is emptied of solution and a final vacuum of not less than 22" mercury will be held for a minimum of one hour. Drippings will then be pumped back to the work tank, final readings taken and retention calculated. Poles that are air-dried or kiln-dried require a one-hour steam-flash to prevent excess drippage.

After treatment, 20 - 2" borings will be randomly taken from the charge. All holes to be plugged per AWPA Book of Standards T1-13, Section 3.1. The outer 1/2” will be discarded and an assay will be completed on the remaining samples. Assay results to be at least 0.38 lbs. per cu. ft. and penetration to be 3" or 90% of sapwood.

Refer to Sections 9, 10 and 11 of “Material Handling Grading Rules and Guidelines at Timber Treating Plant” for handling, banding and loading instructions.

UNION PACIFIC GRADING RULES AND GUIDELINES FOR REHABILITATED TIES (M)

The decision whether a tie will be retained from the grading process for rehabilitation is based on each tie's effectiveness to meet its purpose when it is reinstalled in Union Pacific's trackage.

The following initial determinations need to be made for Tie Grading:

1. Solid wood, no plate area rot is required for further consideration for rehabilitation.
2. All ties should be inspected and categorized with respect to their species; i.e. - Hardwoods or Softwoods.
3. Ties need to be sorted by length;
    a. 9 ft for Mainlines
    b. 8.5 ft for Mainlines and Branch Lines
    c. 8 ft for Yards

    Assumes ties are 7” x 9" in cross section. Ties worn in width beyond anchor wear limits will not be retained for rehabilitation and reinstallation. 6" x 8" yard tie that are of overall excellent condition will be retained for reinstallation in yards.
4. Ties need to be inspected for functioning end plating that is serving its intended purpose.
5. Splits through plate area should govern above splits in the remainder of tie particularly if tie has functioning end plating.
6. Additional criteria are present in the table below. Remember, the overall effectiveness of the tie for its intended use, must be considered in applying the below listed perimeters.

DEFECTS	Branchline/Side UP ITEM #502-7992-3 9’ Branchline/Side UP ITEM #502-7910-3 8.5’ Yard UP ITEM #502-7983-3 8’	Mainline UP ITEM #502-7997-3 9'
ADZE CUT-MAXIMUM	¾”	½”
PLATE AREA MINIMUM THICKNESS AFTER ADZ1NG	6"	6 ¼”
RAIL ANCHOR WEAR	Not to exceed 1”	Not to exceed ½”
ROT	No surface rot allowed in adzed area. Not allowed where it affects durability or strength.	No surface rot allowed in adzed area. Not allowed where it affects durability or strength.
SHAKE	No more than 1/8” between growth rings.	No more than 1/8" between growth rings, fully encased by minimum 1" of wood.
SURFACE CHECKING	Softwood - Max. allowed 3/4" wide, no more than l/2" the length of tie to the heart. Hardwood - Max. allowed 1 " wide, no more than 2" the length of tie to the heart.	Max. allowed 1/2" wide, no more than 4" length, 2" deep.
SPLITS		
HORIZONTAL	Max. length 10”	Max. length 6”
VERTICAL	Max. width ½”	Max. width ¼”
SPIKE HOLE		
	Max. length 10”	Max. length 6”
	Max. width ½”	Max. width ¼”
	Max. length 2" either direction	None allowed
	Max. width 1/8”	
WANE	A full 7 1/2" face must exist at the plate area, 2" allowed throughout entire length of tie.	A full 8" face must exist at the plate area, 1" allowed throughout remaining length of tie.

All spike holes to be plugged with Railroad approved filler with preservative applied in the adzed area. Contractors, through manufacture's laboratory, will do specific manufacture testing of filler samples and the results will be presented to the Railroad's Representative.

Adze out length to be 18".

All Cedrite ties will be rejected.

GUIDELINES FOR PREPLATED WOOD TIES WITH CUT SPIKES (M)

Ties will conform to the existing Union Pacific Railroad wood tie specification including rehab ties. Other materials, such as tie plates and spikes, will also conform to the current applicable specifications for each.

Material will be supplied, previously inspected and accepted by Union Pacific Railroad, for use in the preplating operation. This material will be, for the most part, new, but in the case of tie plates, may include second hand material.

Ties will be the following sizes:

7"x9"x8'
7”x9”x8’6”
7"x9"x9'
7"x9"x10'

Ties will be placed saw-kerf side up for preplating.

The location of tie plates will be determined using a plate placement jig accurate to within +/-0.030 inches which produces product conforming to STD Dwg. 0211, latest rev.

All plate placement jigs will be checked daily to ensure their accuracy. Ten percent (10%) of all completed ties will be checked with calibrated "go/no-go" gauges. Gauges will be accurate to within +/-0.006 inches. The sampling plan will ensure that preplated ties produced from each placement jig are included.

Should any plate locations be found to be out of tolerance, each tie previously fitted using the suspect placement jig, back through the production run, will be checked with the above-mentioned "go/no-go" gauge until 10 successive ties are found to be in tolerance.

The distance between field side shoulders of the two tie plates will be determined by the rail section and rail seat cant. Manufactured per Drawing 0211, latest revision, enclosed.

Maximum tolerance for this dimension is +/-0.060".

Tie plates will be secured during the application process to prevent the tie plates from rotating relative to each other. The maximum skew of one rail seat to the other will be 0.060". This variation must fall within, and not in addition to, the permissible variation between the field side shoulders as specified above.

Tie plates will be centered on the tie with no protrusion of the tie plate over the side of the tie. Ties with tie plates extending over the side of the tie will be rejected and will not be replated.

Fasteners will consist of a minimum of 2 spikes to fasten each tie plate to the tie -one fully-driven field side plate hold-down spike and at least one gauge side-rail spike, driven so that the top of the throat of the spike head is no more than 1.25" and not less than one (1") inch above the rail seat of the tie plate will be applied.

Ties will be bundled with stickers between each layer of ties, sufficient to prevent contact of the top of the gauge rail hold-down spikes with the bottom of the tie above it. Ties will be banded into bundles in sizes specified by the U. P. Material Manager-Ties.

Coach screw application will be as detailed on Drawings 0454 and 0211, latest revision.

Reference gauge spike clearance, as detailed on Dwg. 0211, latest revision.

For Bridge Ties please reference Preplating Dimensions for Bridge Ties drawing.

NOTES:
PRE-BORED HOLES NECESSARY TO INSTALL COACH SCREWS WITH RESILIENT FASTENER TIE PLATES DRILLED TO ONE-HALF INCH FROM BOTTOM OF THE TIE, USING FOLLOWING PRE-BORED DIAMETERS:
11/16"-SOFT WOOD TIES
3/4"-HARD WOOD & COMPOSITE TIES
13/16"-AZOBE TIES

RAIL GAGE SPIKES WILL HAVE 1" CLEARANCE BETWEEN RAIL SEAT AND UNDERSIDE OF SPIKE HEAD.

UNION PACIFIC RAILROAD
ENGINEERING STANDARDS

PREPLATING DIMENSIONS FOR WOOD TIES

STD DWG 0211

ADOPTED: DEC. 31, 1946
REVISED: NOV. 15, 2013
FILE NO.: 0211

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RAIL SIZE (ALL TIES 7" X 9")	QUANTITY SPIKES OR SCREWS	TIE PLATE	A	TIE PLATE	TIE LENGTH	B	ITEM NUMBER	
							HARDWOOD NEW PLATE	HARDWOOD SECONDHAND PLATE
5 1/2" BASE	4 SPIKES	13" SPIKE 8 HOLE MP-13	65"	554-3779-2	8'	15 1/2"	-	502-8793
					8'-6"	18 1/2"	-	502-7981
					9'	21 1/2"	-	502-9700
	8 SCREWS	15" ROLLED FOR E-CLIPS	65"	503-6342-0	8'-6"	18 1/2"	502-7902	-
					9'	21 1/2"	502-7976	-
					10'	27 1/2"	502-7975	-
	4 SPIKES	14" SPIKE 8 HOLE MP-14	65 3/4"	554-4445-2 OR 554-3223-2	8'	15 1/8"	-	502-8787
					8'-6"	18 1/8"	-	502-6895
					9'	21 1/8"	-	502-8706
6" BASE	4 SPIKES	14" SPIKE 8 HOLE BNUP	65 3/4"	554-3230-0	8'	15 1/8"	502-7973	-
					8'-6"	18 1/8"	502-7974	-
					9'	21 1/8"	502-7977	-
	6 SPIKES	16" SPIKE 6 HOLE	65 3/4"	554-3240-0	8'-6"	18 1/8"	502-8898	-
					9'	21 1/8"	502-8797	-
					10'	27 1/8"	502-1024	-
	4 SPIKES	16" SPIKE 8 HOLE	65 3/4"	554-3240-2	8'-6"	18 1/8"	-	502-6896
					9'	21 1/8"	-	502-6952
					10'	27 1/8"	-	502-1026
	4 SPIKES	16" SPIKE 6 HOLE UP-16	65 3/4"	544-5334-2	8'-6"	18 1/8"	-	502-6899
					9'	21 1/8"	-	502-6950
					10'	27 1/8"	-	502-1028
	8 SCREWS	16" CAST SAFELOK CLIPS	65 3/4"	503-6219-0	8'-6"	18 1/8"	502-7901	-
					9'	21 1/8"	502-8799	-
					10'	27 1/8"	502-1020	-
	8 SCREWS	16" CAST SAFELOK CLIPS	65 3/4"	503-6219-2	8'-6"	18 1/8"	-	502-6900
					9'	21 1/8"	-	502-9602
					10'	27 1/8"	-	502-1022
	8 SCREWS	16" ROLLED FOR E-CLIPS	65 3/4"	503-6020-0	8'-6"	18 1/8"	502-7966	-
					9'	21 1/8"	502-7889	-
					10'	27 1/8"	502-7999	-

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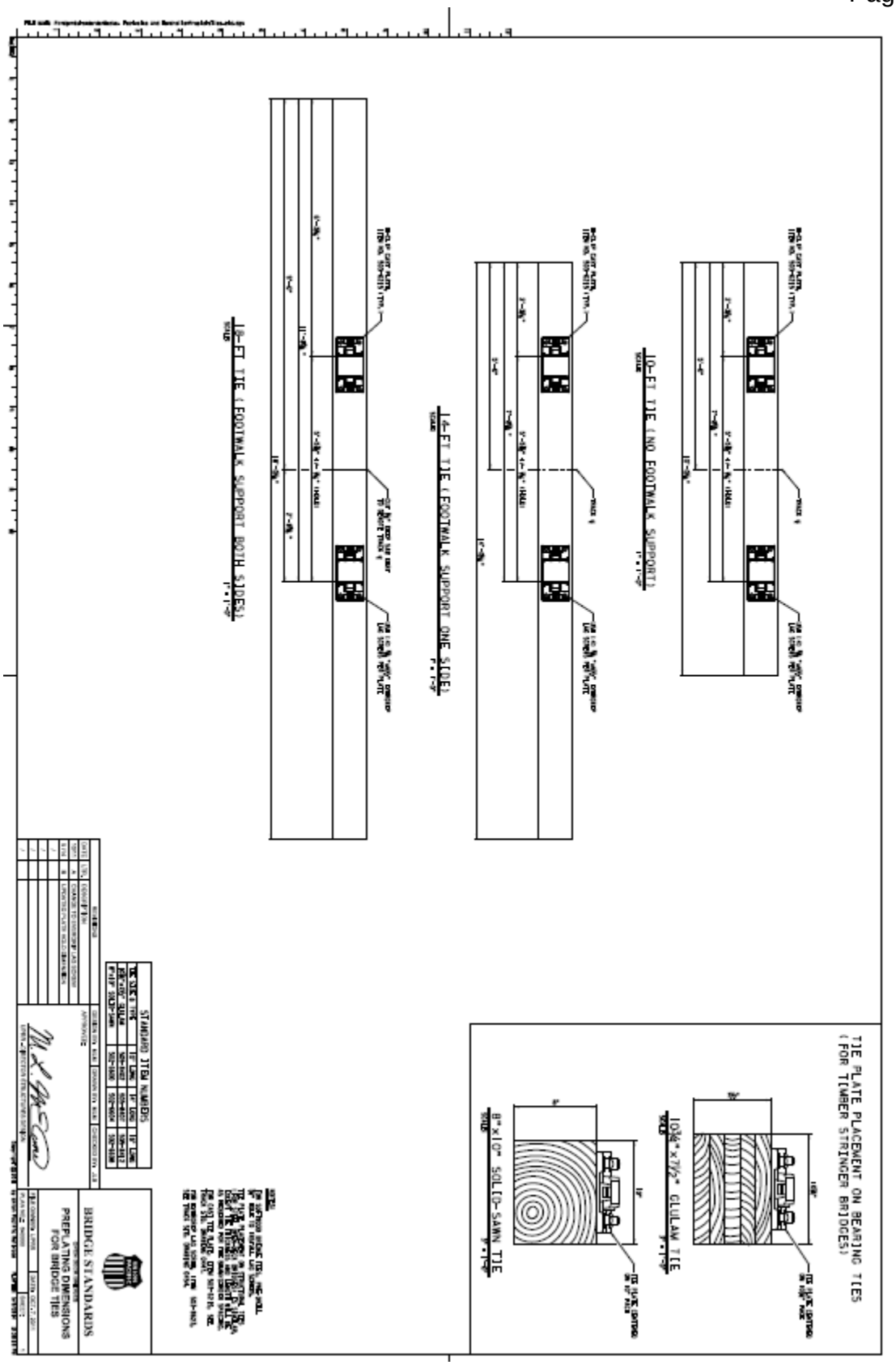
UNION PACIFIC RAILROAD
ENGINEERING STANDARDS

PREPLATING DIMENSIONS FOR WOOD TIES

UNION PACIFIC

ADOPTED: DEC. 31, 1996
REVISED: NOV. 15, 2013
FILE NO.: 0211

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TIE PLATE PLACEMENT ON BEARING TIES
(FOR TIMBER STRINGER BRIDGES)
10"x7½" GLULAM TIE
8"x10" SOLID-SAWN TIE
10-FT TIE AND FOOTWALK SUPPORT
14-FT TIE AND FOOTWALK SUPPORT ONE SIDE
14-FT TIE AND FOOTWALK SUPPORT BOTH SIDES
STANDARD ITEM NUMBERS
BRIDGE STANDARDS
PREPLATING DIMENSIONS FOR BRIDGE TIES