

SECTION 1112—GLUED LAMINATED HARDWOOD TIMBER MEMBERS

1112.01 GENERAL REQUIREMENTS—

(a) **Description.** This work is the fabrication, treatment, delivery, and storage of hardwood glued laminated timber for structural members.

(b) **Definitions.**

1. **Glued Laminated Hardwood Timber.** An engineered, stress-rated product of a timber laminating plant, comprising assemblies of suitably selected and prepared laminations bonded together with adhesives.

2. **Lamination.** The separate lamination thickness shall not exceed 50 mm (2 inches) or be less than 20 mm (3/4 inch). They may be comprised of pieces jointed to form any specific lamination length.

Laminations formed in combination using narrower pieces are not acceptable for bridge stringers. Laminations bent and glued to curve form are accepted for use.

3. **Exterior Use Adhesives.** Use adhesives that perform satisfactorily for all moisture conditions, including exposure to weather, marine use, and where approved preservative pressure treatments are used after gluing. Accepted exterior use adhesives conform to current ANSI/AITC A190.1 requirements.

(c) **Prequalification.** Unless otherwise specified, timber fabricators will be required to prequalify to perform work for the Department by establishing proof of their competency in fabricating members conforming to the current ANSI/AITC A190.1.

Certification of the plant/shop will be performed by the MTD, and submission of a valid certificate to the Structural Materials Engineer, MTD, 1118 State Street, Harrisburg, PA 17120, is required by the Department. An annual endorsed copy is required for continued qualification.

(d) **Shop Drawings.** [Section 105.02](#) and as follows:

Design bridge members in lengths, depths, and widths that can be transported from fabrication source to the project.

Provide design computations prepared by a Professional Engineer registered in the State for Department approval.

It is the Department's prerogative to accept or reject the changes by the Contractor.

(e) **Inspection.**

1. **General.** The MTD will supervise fabrication and treatment inspection. Provide at least 14 calendar days notice of the beginning of work to the Department so that arrangements can be made for inspection.

The Department may waive fabrication or treatment shop inspection and make a complete inspection at a later stage of the construction sequence.

Provide material certification, in duplicate, ensuring that the components used in fabrication were in conformance with material specifications.

2. **Facilities for Inspection.** Furnish necessary supplies for the inspection of materials and workmanship. Allow Inspectors unrestricted access to the premises during plant working hours. Necessary facilities for inspection include a Type C field office as specified in [Section 609](#).

3. **Plant Inspector's Authority.** Plant inspectors have the authority to reject any material or work that does not conform to the requirements of these Specifications.

In case of dispute, the Contractor may appeal to the Representative, whose decision will be final.

4. Rejections. Material, workmanship, or finished members accepted by the inspector at the fabricator's plant and treatment plant may be rejected later if they do not conform to the specifications.

5. Testing. Perform all certification tests when required according to the provisions of the current AITC 200 Inspection Manual or another trade association that certifies glued laminated timber under ANSI/AITC A190.1. Perform all preservative testing according to AWWA Standards.

6. Mill Orders and Shipping Statements. Furnish copies of mill orders and shipping statements, as directed. Ensure that the fabricator presents a copy of the shipping invoice to be stamped for verification of inspection and approval of timber items before shipment to the Department's shop inspector. Forward the stamped copy with the shipment for the project file.

(f) Storage of Materials. [Section 106.05](#) and as follows:

Store fabricated glued laminated materials above ground upon suitable platforms, skids, or other supports.

Keep material free from dirt or other foreign materials and properly protected from moisture. Store glued laminated materials to avoid water or high humidity exposure.

1112.02 MATERIAL—

(a) Lumber.

1. General. Ensure that lumber conforms to the manufacturer's requirements under the American Softwood Lumber Standard PS 20-70. Use only Red Maple, Northern Red Oak, or Yellow Poplar.

2. Grading. Grade the lumber according to appropriate grading agency or inspection bureau rules. Grade red maple and northern red oak according to Northeast Lumber Manufacturer's Association (NELMA) rules. Grade yellow poplar according to Northern Softwood Lumber Bureau (NSLB) rules. Certify as specified in [Section 106.03\(b\)3](#).

3. Moisture Content. Maintain average moisture content of hardwood lumber at 12% to 15%. Any deviations from these lumber moisture content conditions must be approved.

(b) Adhesives.

1. General. Use any fully exterior adhesive for face joint bonding of laminations provided that adhesives have been qualified under appropriate sections of ANSI/AITC A190.1.

Acceptable face bonding includes either a 100% resorcinolic adhesive or in formulation with phenolic base adhesives.

End-joint connections must be bonded with a similar fully exterior adhesive or a 100% melamine base adhesive.

2. Exterior Adhesives. Examples of adhesive formulations shown acceptable for face lamination are:

Cascophen RS-254 (Resorcinol Adhesive)
 Penacolite G1131 (Resorcinol Adhesive)
 Cascophen LT-75 (Phenol with Resorcinol Adhesive)
 Cascophen LT-5210 (Phenol with Resorcinol Adhesive)
 Penacolite G1260 (Phenol with Resorcinol Adhesive)

Acceptable performance with use of these exterior adhesives is species dependent and is maintained through strict lamination procedures to achieve optimum bond development.

(c) Marking.

1. Mark all glued laminated hardwood timber bending members for orientation of end-use application. Mark straight or slightly cambered members with identification to denote proper top versus bottom beam orientation.

2. Include the word “TOP” by permanently labelling with routed letters approximately 50 mm (2 inches) high with identifications.

Members intended for axial load application or of symmetric construction suited for either up or down installation need not be labelled.

Appropriately stamp members with a quality mark or other documentation indicating conformance with ANSI/AITC A190.1. Certify as specified in [Section 106.03\(b\)3](#).

(d) Treatment Chemicals. Treat northern Red Oak, Red Maple, and Yellow Poplar glued laminated members with an AWPAs accepted oil base preservative. For creosote or creosote solution treat to a minimum 185 kg/m³ (11.5 pounds per cubic foot) assay retention. Other oil base treatments must meet minimum retentions conforming to AWPAs C14.

Conduct retention and penetration assay according to AWPAs C28.

Sample Northern Red Oak and Red Maple for soil contact as required for Southern Pine (refer to AWPAs C28, Table 1).

Sample Yellow Poplar for soil contact as required for Pacific Coast Douglas-Fir (refer to AWPAs C28, Table 1).

1112.03 FABRICATION—

(a) Required Standards. Fabricate structural glued laminated hardwood timber according to the requirements put forth in the current ANSI/AITC A190.1 and AITC 119.

Treat all structural glued laminated bridge members to minimum retention and penetration requirements.

(b) Lumber Preparation.

1. **Moisture Content.** Maintain moisture content for lumber received, at the Laminator's shop/plant, between 12% and 15%.

2. **Surfacing Tolerances.** Current ANSI/AITC A190.1.

3. **End Joints.** Current ANSI/AITC A190.1.

(c) Laminating Requirements. Current ANSI/AITC A190.1. Conduct red maple and yellow poplar lamination fabrication according to the general requirements for a 24F-E4 or 24F-E1 southern pine glued laminated timber (refer to AITC 117, Table 1) with special lumber stiffness and edge knot restrictions as follows:

Outer Tension Zone	10% 2.0-1/6 E-rated
Inner Tension Zone	15% 1.8-1/3 E-rated
Core	50% No. 2 VSR (NELMA, NSLB)
Inner Compression Zone	15% 1.8-1/3 E-rated
Outer Compression Zone	10% 2.0-1/3 E-rated

Conduct Northern Red Oak lamination according to the AITC 119 for the fabrication of Combination A glued-laminated timbers.

For applications other than girders no special laminating requirements apply other than minimum No. 2 lumber grade.

Provide hardwood glued laminated timbers at the treatment facility conforming to these requirements with a minimum 12% and maximum 19% moisture content.

Accept only hardwood glued laminated timbers that conform to these requirements. Certify as specified in [Section 106.03\(b\)3](#).

(d) Surfacing of Laminated Members. Surface according to AITC 110. Provide industrial appearance hardwood glued-laminated members.

(e) Holes and Countersinks for Bolts, Dowels, Rods, Nails, and Screws.

1. **Preservative Treatment.** [Section 1031.3\(b\)1](#)

2. **Location Tolerances.** [Section 1031.3\(b\)1](#) and [1031.3\(b\)2](#)

3. **Temporary Attachments.** [Section 1031.3\(e\)](#)

4. **Diameter.** Size holes for driftpins, machine bolts, rods, and lag screws to allow in-service shrinkage and swelling of the wood. For dowels, drifts, pins and rods, match the hole diameter with the connection shank. For lag screws, refer to National Design Specifications (NDS), NDS Section 9.1.2. For machine bolts, refer to NDS Section 8.1.2 for size.

(f) Shop Assembly. Ensure that all fabricated members assemble together according to the shop and design drawings before shipping components to the job site.

1112.04 TREATMENT—

(a) General. Treat all glued laminated hardwood timber surfaces with an approved oil-borne preservative conforming to AWWA C1.

(b) Treatment Facilities. All treatment facilities must be prequalified by the Department by establishing proof of their competency and efficacy of their treating operation with the MTD.

(c) Creosote Treating Cycle. An empty cell cycle shall be used for creosote treatment of northern red oak, red maple and yellow poplar glued laminated timber bridge members. Provide initial air pressure between 140 kPa and 210 kPa (20 pounds per square inch and 30 pounds per square inch). Creosote solutions shall be introduced into the chamber and pressurized to 1035 kPa to 1380 kPa (150 pounds per square inch to 200 pounds per square inch). The actual pressure will depend upon hardwood species being treated. Treatment temperature shall be between 88 °C and 99 °C (190F and 210F). Continue treatment pressure and temperature until 190 kg/m³ (12 pounds per cubic foot) gauge retention is achieved. Gauge retention is confirmed by assay measurement to ensure a minimum 185 kg/m³ (11.5 pounds per cubic foot) creosote retention.

Following the pressure cycle, the pressure shall be released in a slow step down manner over a 1-hour period. An expansion bath during the “slow pressure release” shall be used with an increase in temperature in the treating chamber of 6 °C (43F) following the pressure release. The creosote solution is removed from the cylinder and a minimum vacuum of 74 kPa (11 pounds per square inch) shall be applied for 2 hours. At this time the vacuum is released to atmospheric pressure and, if possible, the surface is steamed for 1 hour. A final minimum vacuum of 74 kPa (11 pounds per square inch) is applied to the treated members for 2 hours.

This treating cycle will ensure a minimum amount of exudate during the service life of the member. It is the Department's prerogative to accept or reject treated hardwood glued laminated members, after pressure treatment that do not minimize exudate.

(d) Field Treatment. Field treat any preservative treated hardwood according to AWWA M4.

(e) Finish. Oil-borne preservative treated hardwood glued laminated members do not require a finish or sealer treatment. Do not use treated hardwood glued laminated railings where prolonged exposure to direct human contact is likely without application of a finish sealer.

Provide a two-coat sealer application for finish treatment for treated railings where prolonged exposure is likely. Acceptable sealers include latex epoxy, urethane, shellac, or other finishes that are effective coating agents that adhere to treated rails.

(f) Shipping, Field Storage, and Field Handling.

1. **Storage and Handling.** [Section 1031.3\(a\)](#)
2. **Cuts and Abrasions.** [Section 1031.3\(e\)](#)
3. **Temporary Attachments.** [Section 1031.3\(e\)](#)