

# *AITC - TECHNICAL NOTE 24*

## GUIDE FOR SPECIFYING STRUCTURAL GLUED LAMINATED TIMBER

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This document is intended to provide basic guidelines for specifying structural glued laminated timber. The first section is a general commentary intended to provide brief background information to the designer and references for more detailed information. A sample specification follows the general commentary.

Structural glued laminated timber may be designed and specified by the engineer or architect for a project, or it may be designed by the manufacturer. All glued laminated timber shall be designed according to the applicable provisions in *AITC 117-Design*, *AITC 119*, the *Timber Construction Manual*, and the *National Design Specification<sup>®</sup> for Wood Construction (NDS<sup>®</sup>)*. For specialty products, such as arches and pitched-and-tapered curved beams, the manufacturer should be contacted as early as possible in the design process, whether the members are designed by the manufacturer or by the project engineer.

#### Critical Specification Information

For each structural glued laminated timber member, the following information should be communicated to the manufacturer.

- 1. Quality Mark-** All structural glued laminated timber should be manufactured in conformance with standard *ANSI/AITC A190.1* in facilities inspected by the American Institute of Timber Construction (AITC). AITC's quality mark ensures that the manufacturer meets stringent quality control guidelines to ensure consistent quality and reliable performance. For members that will be exposed on all sides, where a quality stamp may have an undesirable appearance, members should be accompanied by a certificate of conformance. More information regarding the AITC Quality Inspection Program and Quality Mark is available in AITC Technical Note 10.
- 2. Stress Class (or Combination Symbol) and Species-** Structural glued laminated timber can be manufactured from a number of species and grades of lumber in various combinations. To ensure adequate structural performance for the intended use, it is necessary to specify the appropriate stress class (or combination symbol) and species required. Specification by stress class simplifies design and allows manufacturers to choose from several combinations with similar properties based on their lumber resources, thus increasing availability and possibly reducing price. *AITC 117-Design* and *NDS<sup>®</sup>* include design values for softwood structural glued laminated timber stress classes and combinations. *AITC 119* and *NDS<sup>®</sup>* include design values for hardwood structural glued laminated timber combinations.
- 3. End Use Requirements-** For most applications, structural glued laminated timber does not require preservative treatment. However, structural glued laminated timber for use in outdoor exposures (not protected by roof covering), in ground contact, in environments with high humidity, or in contact with water should be treated with a suitable wood preservative in accordance with *AITC 109* or manufactured from the heartwood of a naturally decay-resistant species. Some species do not treat well with certain preservatives, and availability may be limited. Available treatments also vary between manufacturers. It is recommended that the

manufacturer be contacted to discuss options for decay resistance if required. Where possible, it is recommended that glued laminated timbers be designed and detailed to keep them dry, rather than relying on preservative treatment to prevent decay. *AITC Technical Note 12* provides guidelines for designing structural glued laminated timber for permanence.

4. **Geometry and Dimensions-** Structural glued laminated timber can be manufactured in many sizes and shapes. The size and shape are determined from architectural and engineering requirements. Most glued laminated timber is manufactured with rectangular cross sections, but other special cross section shapes may also be manufactured. Specification of non-rectangular cross sections should be accompanied by drawings with all applicable information. Standard cross sectional dimensions are given in *AITC 113*. In addition to cross sectional shape, the geometry of the member along the length should be specified. For beams, radius of curvature or camber requirements should be specified as required. Specification for pitched and curved beams, arches, tapered beams, trusses, and other custom members should be accompanied by drawings from the designer. All required dimensions should be specified.
5. **Special Fire Code Requirements-** Large exposed timbers are recognized in model building codes as having excellent fire resistance. Minimum timber sizes and other requirements for heavy timber construction are specified in the codes and allow for increased building areas. Exposed structural glued laminated timber is also permitted to be used where building codes require one or two hour fire resistive construction. To meet code requirements for one and two hour fire resistance ratings, the members are required to be oversized in accordance with *AITC Technical Note 7* or the 2001 *NDS*<sup>®</sup> to increase their fire endurance time. The layup of the glued laminated timber is also required to be modified by the manufacturer to ensure adequate fire performance. The quality stamp will indicate that the manufacturer has made required layup modifications. Because the increased dimensions and the special layup requirements will increase the cost of the members, fire resistance ratings are not typically specified unless required by the building code. Steel members and fasteners used in fire rated construction are also required to be protected and must be detailed by the designer.
6. **Appearance Grade-** AITC has standardized four appearance grades: Framing, Industrial, Architectural, and Premium. Complete descriptions of these grades are provided in *AITC 110*. Special appearance requirements that are not covered by the standard appearance grades should be specified. Some examples include special surfacing requirements such as rough sawn texturing or special lamination thickness for visual reasons. If curved members with different radii are used in close proximity, it may be desirable to specify that all members be manufactured with identical lamination thickness, so nearby members will match visually. Mixed species requirements or prohibitions should also be communicated. Any special requirements may limit availability.
7. **Finish Requirements-** Certain manufacturers provide coatings, paints, or sealants to finish and/or protect the structural glued laminated timber from incidental moisture exposure. Individual manufacturers should be contacted to determine the coating options available.
8. **Fabrication Details-** Fabrication details should accompany the order for structural glued laminated timber. It should be made clear who will perform the fabrication and who is responsible for the structural analysis of the connection details.
9. **Wrapping Requirements-** *AITC 111* discusses recommendations for protecting structural glued laminated timber during transit, erection, and storage. Appropriate specifications should be chosen from that standard.
10. **Other Requirements-** Any other requirements should be clearly communicated to the manufacturer in the specifications.

## Sample Specification

### Scope

All structural glued laminated timber shall be furnished as shown detailed on the plans and specified herein.

### Quality Mark

All structural glued laminated timber shall be manufactured in accordance with *ANSI/AITC A190.1-2002*. Each timber shall be marked with the AITC Quality Mark or be accompanied with an AITC Certificate of Conformance. Only timbers specified to be surfaced on all four sides for appearance requirements shall not be grade marked, but shall be accompanied by an AITC Certificate of Conformance.

### Stress Class (or Combination Symbol) and Species

All softwood structural glued laminated timber beams shall meet the requirements of Stress Class \_\_\_\_\_ from *AITC 117-2001 Design* or *2001 National Design Specification*<sup>®</sup>. Unless otherwise specified beams shall have [balanced, unbalanced] layup.

All hardwood structural glued laminated timber beams shall meet the requirements for Combination Symbol \_\_\_\_\_ from *AITC 119-96* or *2001 National Design Specification*<sup>®</sup>.

All structural glued laminated timber columns shall meet the requirements for Combination Symbol \_\_\_\_\_ from *AITC 117-2001 Design*, *AITC 119-96*, or *2001 National Design Specification*<sup>®</sup>. Special tension laminations shall not be required unless otherwise noted.

All softwood structural glued laminated arches shall meet the requirements for Combination Symbol \_\_\_\_\_ from *AITC 117-2001* or *2001 National Design Specification*<sup>®</sup>.

All structural glued laminated timbers shall be manufactured from [any species meeting stress requirements, Douglas Fir-Larch, Southern Pine, Alaska Cedar]

*Note: Other species, including hardwoods, are available on a limited basis. Contact AITC or the structural glued laminated timber manufacturer for information.*

### End Use Requirements

Structural glued laminated timbers will be subject to [dry use, wet use]. Structural glued laminated timbers shall be [untreated, pressure treated with \_\_\_\_\_ preservative to a retention of \_\_\_\_\_ lb/ft<sup>3</sup> in accordance with *AITC 109-98*].

### Special Fire Code Requirements

Structural glued laminated timber combinations [shall, shall not] be modified to meet the layup requirements for [one hour, two hour] fire resistance rating and marked accordingly as required by with *ANSI/AITC A190.1-2002*.

*Note: If fire resistance rating is required, timbers must be sized by the designer according to AITC Technical Note 7 or Chapter 16 of 2001 National Design Specification<sup>®</sup> in addition to having layup modifications.*

### Appearance Grade

Appearance of members shall meet the requirements of the [Premium, Architectural, Industrial, Framing] Appearance Grade as described in *AITC 110-2001*:

### Finish Requirements

Members shall be [uncoated/unsealed, coated/sealed with \_\_\_\_\_].

### Fabrication Details

Fabrication detail "shop drawings" [are, are not] attached. Fabrication shall be performed by [manufacturer, other than manufacturer]. Connection hardware shall be supplied by \_\_\_\_\_. Steel fasteners shall be conform to ASTM A307 unless otherwise noted. Other Steel shall conform to ASTM A36 unless otherwise noted.

### Wrapping Requirements

Members shall be [not wrapped, load wrapped, bundle wrapped, individually wrapped].

## References

- AITC Quality Control Program. Technical Note 10. American Institute of Timber Construction. Englewood, Colorado.
- Calculation of Fire Resistance of Glued Laminated Timbers. Technical Note 7. American Institute of Timber Construction. Englewood, Colorado.
- Designing Structural Glued Laminated Timber for Permanence. Technical Note 12. American Institute of Timber Construction. Englewood, Colorado.
- National Design Specification® for Wood Construction. 2001. American Forest & Paper Association. Washington, D. C.
- Standard Appearance Grades for Structural Glued Laminated Timber. AITC 110-2001. American Institute of Timber Construction. Englewood, Colorado
- Standard for Dimensions of Structural Glued Laminated Timber. AITC 113-2001. American Institute of Timber Construction. Englewood, Colorado.
- Standard for Preservative Treatment of Structural Glued Laminated Timber. AITC 109-98. American Institute of Timber Construction. Englewood, Colorado.
- Standard Specifications for Structural Glued Laminated Timber of Softwood Species. AITC 117-2001-*Design*. American Institute of Timber Construction. Englewood, Colorado.
- Structural Glued Laminated Timber. ANSI/AITC A190.1-2002. American Institute of Timber Construction. Englewood, Colorado.
- Timber Construction Manual. 4<sup>th</sup> edition. 1994. American Institute of Timber Construction. Englewood, Colorado.