AMERICAN INSTITUTE OF TIMBER CONSTRUCTION

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AITC 115-2009

STANDARD FOR FABRICATED
STRUCTURAL TIMBER
COMPONENTS AND ASSEMBLIES

Adopted as Recommendations February 6, 2009
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1. PURPOSE

The purposes of this standard are (1) to establish nationally recognized requirements for the fabrication (as defined in Section 7) of structural timber components and assemblies and (2) to provide a common basis of understanding with respect to what constitutes sound requirements for the fabrication of structural timber components and assemblies. This standard does not replace or override the requirements of ANSI/AITC A190.1, which governs the manufacture of structural glued laminated timber, or any standard grading rules approved by the Board of Review of the American Lumber Standard Committee (ALS) which govern visually graded timbers.

2. SCOPE

This standard describes the recommended minimum requirements for the shop-fabrication of structural timber and related components, including personnel, equipment and facilities, materials, and fabrication. It also describes the quality control system and the functions of an accredited inspection agency. These

requirements are intended to permit any suitable method of fabrication that will produce a product of equal or superior quality to that specified.

3. REQUIREMENTS

3.1 Personnel. The fabrication of structural timber and related components in conformance with this standard requires properly trained and experienced personnel supervising the various stages of fabrication and the quality control system. The following paragraphs set forth the minimum requirements for the qualifications and responsibilities of such personnel.

3.1.1 Fabrication Personnel. There shall be named fabrication personnel directly responsible to management for the direction of fabrication. All fabrication personnel shall be adequately trained to ensure safe operation of equipment and handling of materials.

3.1.2 Quality Control Personnel. There shall be at least one qualified person directly responsible to the management for the direction and maintenance of the quality control system. It shall be the responsibility of this person to ensure that the fabrication procedures and the finished product conform to the job specifications and requirements herein. This person shall also maintain records in accordance with the requirements herein.

3.2 Equipment and Facilities. In order to fabricate structural timber and related components conforming with this standard, it is necessary to have adequate facilities and equipment. While it is not the intent of this standard to dictate the specific type of facilities and equipment a fabricator must have, a minimum set of requirements is necessary to ensure production of a quality product in conformance to this standard.

3.2.1 Facilities. Facilities shall be such that the requirements of this standard can be met. The following minimum facilities are required:

(a) Space and shelter for storage of timber materials to ensure that the moisture content and temperature are maintained within acceptable limits, protecting the timber from checking, decay, insect attack, and other deterioration or damage.

(b) Space and shelter for storage of metal components to ensure that degradation and damage do not occur.

(c) Fabricating facilities such that moisture content and temperature of timbers is maintained within acceptable limits during the fabrication process.

3.2.2 Fabrication Equipment. Equipment shall be suitable for the intended uses and shall be well maintained. The following minimum equipment is required:

(a) Saws, drills, and/or other machinery capable of producing clean-cut holes and surfaces without crushing or tearing of wood fibers and within the tolerances of this standard.

(b) Measuring devices capable of ensuring the placement of holes, cuts, and other fabrication within the tolerances of this standard.

(c) All tools required for the proper installation of split rings and shear plates and any other specialty fasteners if they are used.

(d) Equipment suitable for marking individual fabricated members for identification.

3.2.3 Quality Control Equipment. The following equipment is necessary for the fabrication of quality products meeting the requirements of this standard and shall be well maintained and available at all times within the fabricating facility. Calibration of equipment shall be maintained and verified regularly.

(a) The necessary gauges, calipers, tapes, and instruments to assure conformance with the fabrication tolerances of this standard.

(b) Moisture meter; and oven test equipment or other approved equipment for checking moisture meters.

(c) Identification marking equipment.

3.3 Shop Drawings. When required, shop drawings shall have the approval of the customer and/or the engineer responsible for the performance of the component or assembly. Questions pertaining to type, grade, quality or dimensions of materials shall be documented and verified.

3.4 Materials. All materials shall be of the grade, quality, and dimensions specified in the approved shop drawings and specifications.

3.4.1 Structural Glued Laminated Timber. All structural glued laminated timber shall be marked in accordance with ANSI/AITC A190.1.

(a) For material manufactured outside the premises of the fabricating facility, quality marks and/or certificates of conformance as required by ANSI/AITC A190.1 shall be verified upon receipt of the material at the fabricating facility.

(b) The combination symbol or stress class of the fabricated timber shall correspond to that specified on the approved shop drawings or specifications.

(c) The moisture content of structural glued laminated timber shall be maintained below 16% during storage and fabrication unless the fabricated timbers will be used in a wet environment and have been properly treated with pressure preservatives according to AWPA Standards U1-06 and T1-06.

(d) The size of structural glued laminated timber components shall be as specified on the approved shop drawings and specifications.

(e) Ripping of structural glued laminated timber across its depth or width to make smaller size members shall not be permitted, except by laminated timber manufacturers as permitted by ANSI/AITC A190.1.

(f) Tapered members shall be obtained from a structural glued laminated timber manufacturer with taper cuts fabricated during the manufacturing process,

unless field tapering is permitted by the specifications. Taper cuts shall not be permitted on the tension side of beams.

3.4.2 Solid Wood Components. Solid sawn timber components shall be of the size, grade, species, and type specified on the approved shop drawings or specifications, and at the time it is brought into the facility, shall bear the appropriate mark of an ALSC accredited lumber grading agency .

Note: *Typically, consideration should be made by the designer to accommodate dimensional changes in wood members due to cyclic changes in humidity conditions.*

3.4.3 Other Wood Components. Other timber components such as structural composite lumber components shall be of the size, grade, species, and type specified on the approved shop drawings or specifications.

3.4.4 Hardware. Hardware shall be of the grade, size, and type specified on the approved shop drawings or specifications. Metal components shall be protected from weather and other degrading effects during storage and fabrication.

(a) Steel plates, hangers, etc. shall be of A36 grade steel unless specified otherwise.

(b) ASTM A307 bolts and lag screws meeting the tolerances of ANSI/ASME B18.2.1 shall be used unless specified otherwise.

(c) Shear plates shall meet the requirements of ASTM D5933.

(d) Split rings shall be of SAE 1010 hot rolled carbon steel.

(e) Timber rivets shall meet the requirements of ASTM F1667.

(f) Other fasteners, including nails, spikes, wood screws, and drift pins, shall be of the size, type, and quality specified.

3.5 Fabrication. The product shall exhibit a high quality of workmanship which meets all of the requirements of this standard. Holes and cut surfaces shall be well machined without crushing or tearing of wood fibers.

3.5.1 Patterns. Jigs, patterns, templates, or other suitable means shall be used for all complicated and multiple assemblies to ensure accuracy, uniformity, and control of all dimensions. Connection hardware shall be permitted to be used as a template for locating holes for fasteners.

3.5.2 Connectors. Machining for timber connectors including split rings and shear plates shall be performed with tools designed or recommended by the connector manufacturer specifically for that purpose.

3.5.3 Welds. All welding shall be performed by a welder certified for the specific techniques, and positions being used in conformance to applicable standards of the American Welding Society or approved by a Certified Weld Inspector. When welding or cutting of metal by

torch is required, suitable precautions shall be taken to avoid damage to timber components. Welds shall not be located where they will interfere with the assembly of the connection.

Note: This requirement is not intended to preclude the placement of welds on the side of a steel plate toward the timber member, inasmuch as the connection is detailed to accommodate the weld. A common example of appropriate practice is shown in AITC 104-2003, Figure 2.1.

3.5.4 Holes and Cuts. All cutting, drilling, and framing shall comply with good practice in the industry and applicable specifications.

(a) Spacing and location of all holes for fastenings within a joint shall be in accordance with the shop drawings and specifications with tolerances as agreed upon by the designer and the fabricator. The fabrication of members to be assembled at any joint shall permit assembly.

(b) Bolt holes for structural connections shall be 1/16 in. larger than the bolt diameter for bolts ½ in. or larger in diameter, and shall be 1/32 in. larger than the bolt diameter for bolts smaller than ½ in. in diameter, unless specified otherwise.

(c) Holes for bolts shall be true within tolerances agreed upon by the designer and the fabricator. Holes in connecting parts shall line up as required to permit assembly.

(d) Lengths of members or assemblies shall be within plus or minus 1/16 in. for members up to 20 ft in length and shall be within plus or minus 1/16 in. per 20 ft of length or fraction thereof for members or assemblies over 20 ft long, unless otherwise specified or agreed upon by the designer and fabricator.

(e) Trimmed ends shall be square within 1/16 in. per ft of depth and width, unless otherwise specified or agreed upon by the designer and fabricator.

(f) Bearing surfaces shall be cut to provide contact over the entire surface, unless otherwise specified or agreed upon by the designer and fabricator.

(g) Sufficient clearance shall be provided between sides of steel connection hardware and wood members to permit installation. The side clearances between nonbearing surfaces of steel assemblies and timber members shall not exceed 1/8 in. per side, unless otherwise specified or agreed upon by the designer and fabricator.

(h) Variations in tolerances shall be permitted when approved by the engineer responsible for the performance of the component or assembly.

3.5.5 Piece Mark Identification. If more than one size or type of a fabricated member is to be shipped, members shall be suitably marked to reference or keyed to the assembly and/or erection diagrams.

3.6 Assembly. When required, shop assembly of components shall ensure that parts lie in the proper plane (or planes) and are properly fitted.

3.7 Refabrication. Members which have been misfabricated shall be permitted to be subsequently refabricated with approval from the engineer responsible for the performance of the component or assembly.

4. QUALITY CONTROL SYSTEM

4.1 General. Fabrication conforming with this standard shall be in accordance with a quality control system that is established, implemented, and maintained by the fabricator and is approved and audited by an accredited inspection agency.

4.2 Quality Control Manual. Quality control procedures shall be fully described in a quality control manual. Production check points and inspection procedures shall be included in the quality control manual. The quality control manual shall be approved by the accredited inspection agency.

4.3 Fabrication Manual. Fabrication procedures shall be described in a fabrication manual. Requirements for performing the various tasks in shop fabrication shall be documented. As new procedures are developed, they shall be added to the fabrication manual. The fabrication manual and procedures shall be available for review by the accredited inspection agency.

4.4 Records. Records of quality control procedures shall be maintained by the fabricator for a minimum of five years.

4.5 Inspection and Test Procedures. The quality control system shall ensure that materials meet job specifications and that fabrication conforms to the tolerances of this standard. Records of inspections and tests shall be maintained by the fabricator.

4.5.1 Material Quality. The quality control supervisor shall verify that all materials are of the grade and quality required by the shop drawings, specifications, and this standard. For this purpose, quality marks, certificates, or other identification from the material manufacturer shall be satisfactory.

4.5.2 Moisture Content. The moisture content of wood components shall be determined by moisture meter calibrated in accordance with ASTM D4444, oven drying based on ASTM D4442, or other standard means with sufficient frequency and on a sufficient number of pieces, before fabrication to assure conformance.

4.5.3 Fabrication Controls. The quality control supervisor shall determine that the jigs, patterns, templates, stops, or other means used to mark or hold members during fabrication are set up and maintained so that finished pieces will meet the requirements of this standard and the job specifications. Fabricated pieces and assemblies shall be periodically checked to ascertain that the requirements of the standard are being consistently met.

4.5.4 Product Inspection. All finished products shall be inspected for conformance with the requirements of this standard and the applicable job specification as to dimensions; shape; type, quality, and location of fastenings and connectors; material quality; and moisture content.

4.6 Audit by an Accredited Inspection Agency. All products conforming to this standard shall be fabricated in facilities that are subject to periodic audits by an accredited inspection agency. All processes and records relevant to the fabrication of such products shall be subject to audit.

5. MARKING

5.1 General. All fabricated structural timber components and assemblies represented to comply with this standard shall be distinctively marked.

5.2 Frequency of Marking. Each piece or assembly shall bear at least one mark containing the required identification.

5.3 Required Identification. Each piece or assembly shall be marked with the following:

(a) Identification of this standard. **AITC 115-2009**.

(b) Identification of the accredited inspection agency.

(c) Identification of the fabricating facility.

(d) A job identification number, lot number, or date stamp as a means to trace the member or assembly back to the fabrication and quality control records at the fabricating facility.

(e) Any marks required for appropriate field assembly of components (match marking).

6. ACCREDITED INSPECTION AGENCY

An accredited inspection agency is defined as an organization that:

(a) Operates an inspection system which audits the quality control system of fabricators.

(b) Provides the personnel to perform the audit and to verify conformance with this standard.

(c) Determines the individual fabricating facility's ability to fabricate in accordance with this standard.

(d) Provides periodic audit of the fabricator's operations and quality to assure compliance with this standard.

(e) Enforces the proper use of the inspection agency quality marks and certificates.

(f) Has no financial interest in, or is not financially dependent upon any single company fabricating the product being inspected.

(g) Is not owned, operated, or controlled by any such company.

(h) Provides an arbitration review board to arbitrate disputes between the agency and the fabricator. Such a board shall include, but not be limited to, three persons:

1. A recognized independent authority in the field of engineered timber construction to serve as chairman.
2. At least one registered engineer knowledgeable in the design and use of structural timber.
3. At least one person knowledgeable in structural timber fabrication and quality control.

(i) Is accredited under ISO/IEC Standard 17020 as an Inspection Agency.

7. DEFINITIONS

For the purposes of this standard the following definitions apply:

Accredited inspection agency – an organization that conforms to Section 6 of this standard.

Fabrication – Boring, cutting, sawing, trimming, dapping, routing, planning, and/or otherwise shaping and/or framing timber and related components of assemblies to fit them for a particular place in a final structure.

Piece mark – A mark placed on an individual fabricated component to designate its place in the assembly as indicated by shop drawings.

Quality control system – The means by which a fabricator assures that materials, methods, workmanship, and final product meet the requirements of this standard.

Quality mark – A stamp, brand, label, or other mark which is owned and administered by an accredited inspection agency and which is applied to properly manufactured product by licensed manufacturers to evidence conformance with a nationally recognized manufacturing standard.

Sawn lumber (Solid sawn) – structural lumber which has been manufactured by sawing from a log without laminating or other secondary manufacturing.

Structural composite lumber – laminated veneer lumber, parallel strand lumber, or oriented strand lumber as defined by ASTM D5456.

Structural glued laminated timber – An engineered, stress rated product of a timber laminating plant, comprising assemblies of suitably selected and prepared wood laminations bonded together with adhesives. The grain of all laminations is approximately parallel longitudinally. The laminations may be comprised of pieces end joined to form any length, of pieces placed or bonded edge to edge to make any width, or of pieces bend to curved form during bonding.

8. REFERENCED DOCUMENTS

ANSI/AITC A190.1-2007. American National Standard for wood products – Structural Glued Laminated Timber. 2007. American Institute of Timber Construction. Centennial, CO.

ANSI/ASME B18.2.1-1996. American National Standard – Square and Hex Bolts and Screws (Inch series). 1996. American Society of Mechanical Engineers. New York, NY.

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AWPA T1-06. Use Category System: Processing and Treatment Standard. 2006. American Wood Preservers' Association, Granbury, Texas.

AWPA U1-06. Use Category System: User Specification for Treated Wood. 2006. American Wood Preservers' Association, Granbury, Texas.