

# AMERICAN LUMBER STANDARD COMMITTEE, INCORPORATED®

## GLUED LUMBER POLICY

November 1, 2024

This policy authorizes the Board of Review of the American Lumber Standard Committee (ALSC) to monitor the implementation of procedures by an accredited agency for the certification and quality control of structural glued lumber where such products are grade marked as conforming to the American Lumber Standard. For the purpose of this document, glued lumber includes end-jointed and face-glued lumber. This monitoring by the Board of Review is to determine adherence to specified certification and quality control procedures for structural glued lumber. Additionally, the Board is authorized to determine the competency, reliability, and adequacy of agencies that apply for approval as accredited inspection agencies for glued lumber.

### 1. Definitions

- 1.1. Base Joint Strength** – Base Joint Strength is the minimum joint strength below which no failures are permitted for sample sizes less than 102. This is in contrast to the nonparametric 5<sup>th</sup> percentile (75% confidence) joint strength. See Table 1.
- 1.2. Edge-wise Bending Test** – Specimen orientation such that the wide face surfaces of the board are parallel to the applied load direction.
- 1.3. Failure Modes** – The failure modes observed in testing are classified as described in in ASTM D4688 (see Appendix A).
- 1.4. Fractional Width Cross Section Test specimen**– A small cross section test specimen where all faces showing the joint have been surfaced and joint imperfections have been removed. An example would be a ¾" by 1.5" size cross section adjusted to include a whole number of complete fingers.
- 1.5. Flat-wise Bending Test** – Specimen orientation such that the wide face surfaces are perpendicular to the applied load direction.
- 1.6. Glued lumber** – Lumber that is manufactured from components of limited size as defined in Section 2.2 that are glued together by end-jointing, and/or face-gluing, and in its final form is limited to PS20 sizes and cases where ALSC has approved design values. Face-gluing refers to the gluing of faces or edges.
- 1.7. Joint profile** – Joint profile refers to the orientation of the joint fingers relative to the cross-section of the board. (See pictures in Table 3.)
  - 1.7.1.** If the profile of the fingers is visible on the wider face of the board, the profile is considered vertical.
  - 1.7.2.** If the profile of the fingers is visible on the narrower face of the board, the profile is considered horizontal.
- 1.8. Machine Graded Lumber (MGL)** – Machine graded lumber is distinguished from visually graded lumber in that each piece is nondestructively evaluated for a physical or mechanical property and marked to indicate the appropriate sorted category. Machine graded lumber is also required to meet the visual requirements developed by the respective ALSC rules writing agency.

**1.8.1. Machine Graded Lumber Components (Type A)**

Lumber components only qualified and controlled for MOE.

**1.8.2. Machine Graded Lumber Components (Type B)**

Lumber component qualified and controlled for MOE and strength.

**1.9. Mixed Rule Book Species Glued Lumber**– Mixed Rule Book Species Glued Lumber is glued lumber that is made up of species listed in multiple rules-writing agencies' rule books.

**1.10. Accredited Agency** – An organization, hereafter referred to as the agency, accredited by ALSC that has trained personnel and procedures to ensure the QC/QA system evaluations and grades comply with all applicable requirements of this practice.

**1.11. Reduced Cross Section Test Specimens (also called Ripped Specimens)** – Test specimens with full specimen thickness but ripped to a narrower width than the full width of members being glued. The width may be reduced to 1.5", 2.5" or half the original product width less saw kerf. (See Table 4)

**1.12. Ripped Lumber** – The product of sawing any width of lumber to develop narrower lumber.

**1.13. Ripped Cross Section from Glued Billet** – See examples in Appendix B

**1.14. Visually Graded Lumber** – Lumber produced by identification and appraisal of lumber growth and manufacturing characteristics by visual means as part of the lumber segregation process.

**2. Component Characteristics**

**2.1. Species**

**2.1.1.** The species used to manufacture glued lumber must be an approved species found in species combinations specified in ALSC approved grade rule books or a species previously approved by ALSC for MGL under the ALSC Machine Graded Lumber Policy.

**2.1.2.** Multiple species from multiple species groups are permitted to be glued together.

**2.2. Component Sizes** – Components shall not be less than ½" actual size (12.5mm) in thickness and width. Length of components is typically not less than the width of the component.

**2.3. Wood Quality** – The quality of the components must meet the grade characteristics specified by the manufacturer and be based on rules-writing agency's grading limitations. See Section 8.

**2.3.1. MGL Glued Products**

**2.3.1.1.** Components shall meet the QA/QC requirement for MOE of an equivalent or higher MGL Grade for a Type A MGL final product.

**2.3.1.2.** Components shall meet all the QA/QC requirements for MOE and strength for an equivalent or higher MGL Grade for Type B MGL final product.

**2.3.2. Face Glued Products** Face glued products require monitoring of both incoming and outgoing product quality.

**2.3.3. End-Jointed Products** End-jointed products require monitoring of outgoing product quality.

**2.4. Original Grade Marks** – Original grade marks on incoming material shall be obliterated or concealed

during manufacture of components according to the requirements of the ALSC Lumber Enforcement Regulations Section 5.10.

### 3. Finished Product Lumber Quality

**3.1. Quality Control Procedures** — An applicant agency shall provide the Board with written qualification and quality control procedures that it shall use when authorizing mills to grade-mark glued lumber. The procedures shall require that:

**3.1.1. Finished Product Grade Mark**

**3.1.1.1.** Requirements Visual/MGL marking. The species/species group(s) possible in the glued product shall be identified on the grade mark. See also 3.1.3.2

**3.1.2. Grade**

**3.1.2.1.** The finished product will be graded in accordance with the provisions of PS-20 or the visual grade aspects of the approved MGL grading rules.

**3.1.2.2.** The finished MGL product which is made up of original Type A MGL must be confirmed for joint strength, finished product strength and stiffness of the final product grade mark.

**3.1.2.3.** The finished MGL product which is made up of original Type B MGL must be confirmed by the joint strength of the final product grade mark.

**3.1.3. Allowable Properties**

**3.1.3.1.** The allowable properties assigned to the quality controlled finished product are equal to that of the grade that appears on the grade marked final product.

**3.1.3.2.** If multiple species/groups are glued together, the assigned properties shall be the lowest for any species included on the grade mark.

**3.2. STUD USE ONLY** – Stud use only end-jointed lumber shall be in sizes 2x2 through 2x6 and 3x4 only and in lengths not to exceed 12 feet.

### 4. Adhesive Requirements

**4.1 Glued Structural Lumber** Glued structural lumber shall be glued with adhesives which meet the requirements of ASTM D2559 or other Board approved consensus standard suitable for exterior exposure for structural application, except in the case of STUD USE ONLY end-jointed lumber.

*Note: CSA O112.7 and CSA O112.9 are examples of Board approved consensus standards*

**4.2 STUD USE ONLY** end-jointed lumber shall be glued with:

**4.2.1** PVA adhesives that meet the requirements of Type 1 as specified in ASTM D4317; or meet use requirements of ASTM D5572.

*Note: ASTM D5572 explicitly covers mechanical properties of wood adhesives in end-jointed non-structural wood products. It is provided as an alternate adhesive standard as the test methods described and the minimum test requirements are consistent with the general requirements of adhesives for STUD USE ONLY end-jointed lumber and PVA Type 1 adhesives described in ASTM D4317.*

**4.2.2.** An adhesive that meets the requirements of ASTM D2559 with the exception of the test for

“Resistance to Deformation Under Static Loading”. Adhesive verification tests using ASTM D2559 shall be carried out using either Douglas fir, western hemlock, southern yellow pine, western larch or other ALSC approved species that meet the requirements of Table 1 in ASTM D2559.

### **4.3 Heat Resistant Adhesives**

#### **4.3.1 End-jointed Lumber**

**4.3.1.1** End-jointed lumber manufactured with adhesives which meet the requirements of 4.3.1.2 shall include the designations “Heat Resistant Adhesive” or “HRA” in the grade mark or structural glued lumber quality mark. (For Non-Heat Resistant Adhesives see Section 4.3.1.4)

**4.3.1.2** Heat resistant adhesives shall be evaluated according to the procedure provided in ASTM D7374 Practice for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber or ASTM D7470 Evaluating Elevated Temperature Performance of End-Jointed Lumber Studs using lumber end-jointed with the adhesive to be qualified according to Section 4 and framed into a wall test specimen. ASTM E119 conditions of acceptance for temperature and passage of flame or hot gases are to be recorded and reported but are not acceptance criteria for the end-jointed lumber adhesive qualification and the ASTM E119 hose stream test is not required. Wall plates shall be selected such that the design load capacity of the wall specimen is limited by the lumber used for studs in compression. The applied static load shall be based on the design load capacity of the lumber used for studs in compression determined according to National Design Specification (NDS). The fire resistance of the wall specimen shall meet or exceed 60 minutes to structural failure when tested in accordance with ASTM E119. A list of approved adhesives is available on the ALSC website at [www.alsc.org](http://www.alsc.org).

**4.3.1.3** A heat resistant adhesive qualified under the provision of 4.3.1.2 is applicable to end-jointed lumber restricted to species and grades having an applied static design load value, determined according to the NDS and based on the applicable Modulus of Elasticity (MOE) and Compression Parallel to the Grain (F-c) stress values, not to exceed that for the lumber used for studs used in the wall test specimen, see ASTM D7374 or ASTM D7470.

**4.3.1.4** End-jointed Lumber shall be labeled “Non-Heat Resistant Adhesive” or “Non-HRA” or “NHRA”), except that manufactured with a heat resistant adhesive meeting the provision of Section 4.3.1.2.

**4.3.2 Face-Glued Lumber** The heat resistant adhesive (HRA) used for face gluing shall meet the requirements of ASTM D7374 and ANSI 405 section 3.1.7. If end-jointed lumber components are utilized in the manufacture of the structural face-glued product, the adhesive used in end-joining shall meet the requirements of ASTM D7374

## **5 Required Qualification Tests and Data Adjustments for end-jointed and face-glued Structural Glued Lumber.**

### **5.1 Sample Qualification**

**5.1.1** Face-glued specimens shall be qualified by the shear test shown in 5.2

**5.1.2** End-jointed specimens shall be qualified by bending test shown in 5.3, the tension test shown in 5.4, or both. If only one property is tested, see provisions of 5.3.5 and 5.4.4.

- 5.1.3** When ripped from glued billets all glued lumber final products shall be qualified for bending strength by the bending test shown in 5.3.1.3.
- 5.1.4** Unless otherwise specified, the minimum sample size for qualification is 53 specimens (joints) per property tested. Table 1 provides the nonparametric order statistics for various sample sizes and the number of failures permitted below the base joint strength for qualification, as well as the order statistic used to determine the nonparametric 5% tolerance limit.

<b>Table 1.</b>		
Nonparametric Order Statistics for Several Sample Sizes*		
Sample Size	Number of Pieces Permitted Below Base Joint Strength**	Order statistic equal to 5% nonparametric TL, 75% confidence
53	0	2
78	0	3
102	1	4
125	1	5
148	2	6

\* *Sample sizes selected from ASTM D2915, Table 2. Sample sizes which have whole number order statistics for the 5% NTL, 75% confidence.*

\*\* *See 5.3.3, 5.3.4, 5.3.5, 5.4.3, and 5.4.4 for the required joint strength.*

**5.1.5 Durability/Delamination Test**

Strength and durability requirements stated in the agency's procedures shall apply to all glued lumber based on the applicable sections of recognized consensus standards. The procedures shall require that either:

- 5.1.5.1** the certification and daily quality control specimens selected for strength tests are subject to a durability cycle **prior to strength tests**, or
- 5.1.5.2** cyclic delamination tests shall be performed on selected specimens as part of the certification and daily quality control tests. If delam tests are performed instead of the durability cycle, a minimum of 5 delam tests are required for qualification.
- 5.1.5.3** Green lumber shall be dried to 19% or less moisture content before testing for the cyclic delamination test or durability cycle test.

**5.1.6 Qualification tests** – Qualification tests shall be performed by a testing lab or performed on site with agency supervision. Test equipment shall be calibrated prior to initial use and at least once a year thereafter.

**5.2 Shear Tests for Face Glued Lumber Qualification**

**5.2.1** Shear strength tests shall be performed as part of the qualification for face-glued lumber. Shear strength requirements are based on testing in a manner substantially similar to the applicable methods set forth in accordance with ASTM D905 or the AITC Test T107. The specimens shall

be obtained from pieces selected from normal production at moisture content typical of production. Crosshead movement shall provide approximately a uniform rate of loading not exceeding 0.50 inch per minute. See also 5.1.5

**5.2.2** Minimum qualification sample size = 20 specimens (joints).

**5.2.3** The required joint strength for the fifth percentile tolerance limit (75% confidence) shall be computed in accordance with Equation 1 or other Board approved method:

$$\text{Eq. 1} \quad F_v \leq \left( \frac{F_v^* - Ks^*}{2.1} \right) 0.5$$

where:

- $F_v^*$  = Average shear stress of the test sample
- $s^*$  = Standard deviation of the shear test sample
- $K$  = K Factor for the test sample based on Table 2.
- $F_v$  = assigned  $F_v$  for the species/species group tested
- 0.5 = ASTM D245-22 Section 4.2.3, shear strength ratio
- 2.1 = ASTM D245-22 Table 8, shear clear wood adjustment factor

*Note: No base value is specified.*

<b>Table 2. Equation 1 K Factors* for various sample sizes</b>			
Sample Size	K Factors	Sample Size	K Factors
20	1.932	30	1.869
21	1.924	35	1.849
22	1.916	40	1.834
23	1.908	45	1.822
24	1.901	50	1.811
25	1.895	60	1.795

\* *K factors from ASTM D2915, Table 3. K Factors for One-Sided Tolerance Limits for Normal Distributions. 1-p = 95% TL, 75% confidence.*

**5.2.4** Wood Failure assessment using D5266: Average must equal or exceed 70%.

**5.3 Bending Joint Tests and Data Adjustments for End-joint Qualification and Bending Tests for All Glued Lumber Final Product when Ripped from Glued Billets.**

When bending joint strength tests are performed as part of the qualification procedures for structural end-jointed dimension lumber or bending strength (MOR) tests are performed as part of the qualification for all glued lumber final product when ripped from glued billets the minimum test requirements for bending tests are:

**5.3.1 Bending Test – specimen size**

**5.3.1.1** Bending joint requirements are based on full size specimen testing in accordance

with ASTM D4761 edge-wise bending. Testing in flat-wise orientation is permitted. Testing of reduced cross section (ripped) specimen from full board width end-jointed dimension lumber is permitted. See also 5.1.5.

*Note: One of the reasons for testing a reduced width instead of a full board width specimen is to facilitate edge-wise bending testing at a short span.*

**5.3.1.2** End-joint testing: testing for edge-wise or flat-wise end-jointed specimens is four-point loading with the load heads positioned at a loading span of a minimum of 4" apart, located equidistant from the center of the span. The end-joint to be tested shall be positioned at the midpoint of the span. The total span to depth ratio for the end-joint bending tests should be between 15 and 21.

**5.3.1.3** All glued lumber final product when ripped from glued billets: the load configuration for bending strength testing (MOR) according to D4761 edge-wise bending is  $\frac{1}{3}$  point with a span to depth of 21 to 1. In cases where the length of the test specimen is such that only a span to depth ratio of less than 21 is possible, MOR values shall be corrected using ASTM D1990 size correction models. Modulus of rupture (MOR) shall be determined by applying a test load to a full-size specimen that will induce a maximum stress not less than the characteristic bending strength value for the grade, size, and species combination under consideration.

**5.3.2** Minimum qualification sample size = 53 specimens (joints), see Table 1.

**5.3.3** The required bending joint strength for both the fifth percentile tolerance limit (75% confidence) and the base joint strength shall be computed in accordance with Equation 2, except as provided in section 5.3.5:

$$\text{Eq. 2: } \text{MOR} = 2.1 \times F_b \times C_{1b} \times C_{2b} \times C_3$$

where:

MOR = required bending strength

$F_b$  = assigned  $F_b$  for the species/species group, size and grade tested

*Note: for testing in flat-wise orientation, apply Adjustment Factor For Flat-wise Use provided in certified grading rules of ALSC agencies*

$C_{1b}$  = end-jointing factor of 1.15 for the **fifth percentile estimates**

(Exception: for 2x3  $C_{1b} = 1.10$ )

$C_{1b}$  = 1.00 for the **base joint strength**

$C_{2b}$  = end-joint profile bending factor as shown in Table 3

$C_3$  = reduced width end-joint factor. For full or fractional width cross section test specimen tested in edge-wise or flat-wise bending, use 1.0. Otherwise, use the value in Table 4 for reduced width (ripped) test specimen







**5.3.4** The required MOR for all glued lumber final product when ripped from glued billets for the fifth percentile tolerance limit (75% confidence) strength shall be computed in accordance with Equation 3

$$\text{Eq. 3: } \text{MOR} = 2.1 \times F_b$$

where:

MOR = required bending strength

$F_b$  = assigned  $F_b$  for the species/species group, size and grade tested

<b>Table 3. Values of End-Joint Profile Bending Factors, C<sub>2b</sub></b>				
Test Specimen Type	Bending Test Specimen Orientation <sup>(1)</sup>		Fifth Percentile OR Base Joint Strength	
			Vertical Joint Profile <sup>(3)</sup>	Horizontal Joint Profile <sup>(3)</sup>
				
Full or Reduced Cross Section	Edge-wise		1.00	1.00
	Flat-wise		1.15	1.00
Fractional Width Cross Section	Edge-wise		1.10	1.00
	Flat-wise		1.00	1.10
Durability Specimens (Tested Full, Reduced, or Fractional Width Cross Section)	Edge- or Flat-wise		0.80	0.75

*Note: A fractional width cross section is a cross section where all faces showing the joint have been surfaced and joint imperfections have been removed. See 1.4*

**Table 4. Values of C<sub>3</sub> Factors for End-Joint Specimen Reduced in Width (ripped) for Testing**

Reduced specimen width (actual)	Original (un-ripped) Lumber Board Width (nominal)				
	2x4	2x6	2x8	2x10	2x12
1.5 inches by original thickness (e.g. reduced to nominal 2" width)	1.05	1.11	1.17	1.24	1.33
2.5 inches by original thickness (e.g. reduced to nominal 3" width)	1.03	1.08	1.14	1.21	1.29
Half of original product width less saw kerf	1.05	1.08	1.11	1.15	1.19

*Note to Table 4:*

$$C_3 = \frac{7270 - (177 * h_1)}{7270 - (177 * h_2)}$$

Where  $h_1$  = Reduced width specimen dimension in the direction of the applied test load  
 $h_2$  = Full Board width specimen dimension



**5.3.5. If no Tension Qualification Tests are performed**

If no tension qualification tests are performed and the ratio of  $F_t/F_b$  assigned to the highest grade level qualified exceeds the boundary value shown in Table 5, the following factors shall be substituted in Equation 2:

- $F_b$  = assigned  $F_t$  for the species/species group, size and grade tested
- $C_{1b}$  = end-jointing factor of 1.84 for the **fifth percentile estimates**  
 (Exception: for 2x3  $C_{1b}$  = 1.76)
- $C_{1b}$  = 1.60 for the **base joint strength**

Joint Profile	$F_t/F_b$
Vertical	0.50
Horizontal	0.60

**5.4 Tension Joint Tests for End-joint Qualification**

When tension joint strength tests are performed as part of the qualification procedures for structural end-jointed dimension lumber or tension strength (UTS) tests are performed as part of the qualification for all glued lumber final product when ripped from glued billets minimum qualification test requirements for tension tests are:

- 5.4.1 Tension Specimen Size** Tension joint requirements are based on full size specimen testing in accordance with AITC Test T119. Testing on reduced width (ripped) specimen from full width end-jointed dimension lumber is permitted. Fractional width cross-section specimens shall be at least 0.75" in thickness. The test span shall be of sufficient length to minimize extraneous influences in the joint area resulting from gripping the test specimen. See also 5.1.5.
- 5.4.2** Minimum qualification sample size = 53 specimens (joints), see Table 1.
- 5.4.3** The required tension joint strength for both the fifth percentile tolerance limit (75% confidence) and the base joint strength shall be computed in accordance with Equation 4, except as provided in section 5.4.4:

$$\text{Eq. 4} \quad \text{UTS} = 2.1 \times F_t \times C_{1t} \times C_{2t} \times C_3$$

where:

- UTS = required tension strength
- $F_t$  = assigned  $F_t$  for the species/species group, size and grade tested
- $C_{1t}$  = end-jointing factor of 1.25 for the **fifth percentile estimates**
- $C_{1t}$  = 1.00 for the **base joint strength**
- $C_{2t}$  = end-joint profile tension factors as shown in Table 6
- $C_3$  = reduced width end-joint factor. For full board or fractional width cross section test specimen, use 1.0. Otherwise, use the value in Table 4 for reduced width (ripped) test specimen

<b>Table 6 Values of End-Joint Profile Tension Factors, <math>C_{2t}</math></b>	
Test Specimen Type	Fifth Percentile or Base Joint Strength
	Vertical or Horizontal Joint Profile
Full or Reduced Cross-section	1.00
Fractional Width Cross-section	1.15
Durability (Tested Full, Reduced, or Fractional Width Cross-section)	1.05

*Note: A fractional width cross section is a cross section where all faces showing the joint have been surfaced and joint imperfections have been removed.*

#### 5.4.4 If no Bending Qualification Tests are Performed

If no bending qualification tests are performed and the ratio of  $F_t/F_b$  assigned to the highest grade level qualified is less than the boundary value shown in Table 5, and the following factors shall be substituted in Equation 4:

- $F_t$  = assigned  $F_b$  for the species/species group, size and grade tested
- $C_{1t}$  = end-jointing factor of 0.75 for the **fifth percentile estimates** and
- $C_{1t}$  = 0.60 for the **base joint strength**

#### 6.0 Maximum Knots Permitted in the End-Joint

Agency quality control procedures shall permit knots in the end-joint area no larger than those listed in Table 7.

<b>Table 7</b> Knot limitations in the joint							
Nominal Width	STUD USE ONLY			LUMBER GLUED WITH ADHESIVES MEETING REQUIREMENTS OF ASTM D2559			
	Select Structural	No. 1, No. 2, Construction	Stud, No. 3, Standard, Utility	Select Structural	No.1	No. 2	Construction, Standard, Utility, Stud, No. 3
2"	1/4"	1/4"	3/8"	3/16"	1/4"	1/4"	3/8"
3"	3/8"	1/2"	3/4"	1/4"	3/8"	1/2"	5/8"
4"	1/2"	5/8"	1"	3/8"	1/2"	3/4"	7/8"
5"	5/8"	3/4"	1 1/4"	1/2"	5/8"	7/8"	1 1/8"
6"	3/4"	7/8"	1 1/2"	5/8"	3/4"	1"	1 3/8"
8"				3/4"	1"	1 1/8"	1 5/8"
10"				1"	1 1/8"	1 3/8"	1 7/8"
12"				1 1/4"	1 1/4"	1 1/2"	2"

## 7. Labeling

### 7.1. Final product labeling guidelines – In addition to labeling specified in the lumber enforcement regulations.

- 7.1.1. Agencies shall provide for obliteration of glued lumber grade marks when lots are rejected by the in-plant procedures.
- 7.1.2. If design values are assigned to the glued lumber product, a special grade mark or a separate mark shall be used to indicate that joint integrity is subject to agency quality control. Facsimiles of these marks shall be on file with the Board of Review.

### 7.2. End-jointed lumber End-jointed lumber shall be labeled “Non-Heat Resistant Adhesive” or “Non-HRA” or “NHRA”), except those manufactured with a heat resistant adhesive meeting the provision of Section 4.3.1.2

### 7.3. End-jointed MGL final product labeling guidelines – In addition to labeling specified in MGL policy.

- 7.3.1. Agencies shall provide for obliteration of glued lumber grade marks when lots are rejected by the in-plant procedures.
- 7.3.2. If MGL design values are assigned to the glued lumber product, a special grade mark or a separate mark shall be used to indicate that joint integrity is subject to agency quality control. Facsimiles of these marks shall be on file with the Board of Review

### 7.4. Examples of certified product labels are:

- 7.4.1 CERT FGR JNT, CERT EXT JNTS, CERT END JOINT, GLUED LUMBER
- 7.4.2 CERT FGR JNT VERT STUD USE ONLY, CERT GLUED JNTS VERTICAL USE ONLY, STUD USE ONLY, GLUED LUMBER STUD USE ONLY
- 7.4.3 CERT FGR JNT DRY USE ONLY
- 7.4.4 CERT FACE-GLUED LBR-VERTICAL USE ONLY
- 7.4.5 CERT FACE-GLUED LBR, CERTIFIED EDGE GLUING, CERTIFIED FACE GLUING, CERTIFIED GLUED LUMBER

## 8 Agency Quality Control Procedures

The agency shall have requirements in their procedures for daily quality control at the plant.

### 8.1 Quality Control for Incoming Components

#### 8.1.1 Moisture Content of components

The plant is required to meet the adhesive manufacturer’s requirements when those requirements are more restrictive than the grade rule requirements.

#### 8.1.2 Grade quality of face glued components

The agency shall define the visual requirements for the face glued components. The plant shall confirm the requirements through grading before gluing. (See Section 6.0)

#### 8.1.3 Quality Control of MGL components

The agency shall define the MGL grade requirements for the components. The plant shall confirm traceability of the MGL grade source material before gluing.

**8.2 Quality Control for End Jointed Lumber** – Agency quality control procedures shall require bending and/or tension strength tests be performed as part of the daily procedures for structural end-jointed dimension lumber. Tests shall be conducted as described in Sections 5.1.4 (Durability/Delam) and either 5.3 or 5.4. Minimum test requirements are:

**8.2.1** The minimum sampling rate required shall be either:

**8.2.1.1** One (1) specimen per hour per shift (8 hours) with not fewer than five (5) specimens collected during any production shift of less than five (5) hours.

**8.2.1.2** When all structural glued lumber production is subjected to a proof load of at least 1.3 times the assigned allowable stress the sampling frequency may be reduced to one (1) specimen per four (4) hours per shift (8 hours) with not fewer than two (2) specimens collected during any production shift of less than eight (8) hours.

**8.2.2** All pieces tested shall equal or exceed the fifth (5th) percentile value for the property tested in accordance with 5.3.3 or 5.4.3.

**8.2.3** When a daily QC test value falls below the fifth (5th) percentile value, the test values of at least 27 of the next 28 pieces shall equal or exceed the fifth (5th) percentile target value. All pieces tested shall equal or exceed the base joint strength for the property tested in accordance with 5.3.3 or 5.4.3.

**8.2.4** Failure to meet the above criteria in 8.2.2 and 8.2.3 shall indicate an “out-of-control” condition, requiring requalification by the mill or the agency of the process, and removal of grade marks from non-complying product.

**8.2.5** An agency may adopt other acceptance criteria provided it can demonstrate the procedures provide an equivalent or better degree of control and ability to detect non-complying product.

**8.3 Quality Control for Face Bonded Lumber** – Agency quality control procedures shall require each qualified plant to collect and test glue joint samples as part of the daily plant quality control procedures. Test shall be conducted as described in Section 5.1.5 (Durability/Delam) and Section 5.2

**8.4 Quality Control for All Glued Lumber Final Product When Ripped from Glued Billets** –

**8.4.1** The agency shall provide the required forms, loads, and CUSUM constants for each size and grade produced.

**8.4.1.1** Sampling method: The specimens shall be sampled from grade marked production. The sampling method shall include procedures for selecting the structural face-glued lumber specimens for bending and shear strength test and which portion will be tested for shear and wood failure.

**8.4.2** The minimum sampling rate required shall be:

**8.4.2.1** For Bending strength sampling: One (1) specimen per hour per shift (8 hours) with not fewer than five (5) specimens collected during any production shift of less than five (5) hours.

**8.4.2.2** For Shear Strength Parallel to grain sampling: Two (2) test blocks from each specimen at least 2 feet apart from each other shall be obtained during each one (1) hour or part thereof of operation.

**8.4.3** The results shall be entered into agency approved control forms to establish status of the process. All production from a shift or part thereof shall be held in inventory pending the results of the quality control evaluation.

**8.4.4** The test results for a particular shift shall meet or exceed the requirements for the type of

- product being manufactured and tested.
- 8.4.5** Failure to meet the above criteria shall indicate an “out-of-control” condition, requiring reaffirmation by the mill or the agency of the process, and removal of grade marks from non-complying product.
  - 8.4.6** Out-of-control: when any process properties described in Section 8.2 or 8.3 go “out-of-control”, the item from which the quality control sample was drawn shall be held pending results of the product reassessment.
  - 8.4.7** Reassessment: The Quality Control Supervisor shall randomly select 28-specimen sample(s) from production for whichever of the test(s) that went “out of control” for the shift that was found to be out-of-control. The following steps may be taken pending the results of the 28-specimen bending sample or the results of 28 shear test blocks drawn from 14 shear/wood failure specimens.
    - 8.4.7.1** Bending Strength: When the test results for the bending strength (MOR) test or the testing for joint strength fails to meet requirement of Section 5.2 or 5.3, then the held item shall be deemed to be in non-compliance with the requirements of this policy and all grade marks shall be obliterated from the Structural Face-Glued lumber.
    - 8.4.7.2** Shear Strength: When the test results for shear strength parallel to grain (Fv) fail to meet the requirements of Section 5.2, the held item shall be deemed to be in non-compliance with the requirements of this policy and all grade marks shall be obliterated from the Structural Face-Glued lumber. If the shear test results are found to be “In-control” the facility shall proceed to wood failure evaluation.
    - 8.4.7.3** Wood Failure: If the shear results are “in-control” and the wood failure test results confirm the “in-control” requirements, the held material shall be deemed to comply with the wood failure requirements of this policy. When the test results for wood failure fail to meet the requirements of Section 5.2.4 the held item shall be deemed to be in non-compliance with the requirements of this policy and all grade marks shall be obliterated.
- 8.5 Moisture Content** – Adjustments to test data for moisture content shall be in accordance with ASTM D1990 Annex A1, Section 4.2 or other recognized consensus standard.
- 8.6 Inspections** – Agencies shall conduct at least 12 inspections per year of the visual grading accuracy, production process, and records of grade marked glued lumber except in cases where the producing plant is inactive for a period in excess of 2 months during any 12-month period in which case an inspection of the visual grading accuracy, production process and records of grade marked glued lumber is required for each month the plant is actively producing glued lumber.
- 8.7 Accuracy of Plant Equipment – Agencies** shall confirm the accuracy of the plant testing equipment prior to initial production and once every calendar year thereafter
- 8.8 Records** -- Agencies shall require in-plant test records to be retained for at least one year.
- 9 The American Lumber Standard Committee Board of Review Procedures** ALSC has established the following procedures for the Board in carrying out its responsibility to monitor agencies that are approved as accredited inspection agencies for glued lumber:
- 9.1 Certification and Quality Control Procedures** – Each agency shall provide the Board of Review with the certification and quality control procedures it utilizes in authorizing mills to grade mark glued lumber.

**9.2 Certification and Qualification Procedures for Mixed Species**—If species in different rule-books are combined to produce glued lumber, an explanation of how structural glued lumber certification and quality control procedures are developed shall be provided for approval by the Board of Review.

**9.3 Non-rules-writing Inspection Agencies** — Non-rules-writing inspection agencies shall require certification procedures, quality control testing and record keeping to provide product performance at least equivalent to requirements of rules-writing agencies.

**9.4 Consultants** — The Board may employ consultants to review any evidence submitted. All consultant expenses shall be borne by the applicant agency.

**9.5 ALSC Inspectors** — ALSC inspectors shall review mill records to ascertain whether producers maintain records as required by inspection agencies. ALSC Inspectors shall inspect glued lumber to determine if it meets visual requirements.

**9.6 Records** —ALSC Inspectors shall review agency records to ascertain if the agency is performing those inspections/tests required by its quality control program. ALSC Inspectors shall routinely witness physical tests of glued lumber products.

**9.7 Species Rule Books, Certification and QC procedures** — Rules-writing agencies shall include in their rule books an explanation that structural glued lumber certification and quality control procedures are developed for the species and grades included in the particular rules and that they comply with the ALSC Glued Lumber Policy.

**9.8 HRA Certification and QC procedures** — Rules-writing agencies shall include provisions for specification, qualification, and labeling of heat resistant adhesive structural glued lumber in their rules, and certification and quality control manuals. (See 4.3.1.2).

**9.9 Certification and Quality Control** – ALSC accredited agencies shall include in their certification and quality control procedures an explanation that their structural glued lumber certification and quality control procedures comply with the ALSC Glued Lumber Policy, that the responsibility for the certification and quality control procedures is that of the agencies and that the Board shall monitor whether the certification and quality control procedures are being carried out by the agencies.

**9.10 ALSC Recognized Logo** — Grading agencies accredited by ALSC to grade mark glued lumber shall use their ALSC recognized logo only on glued lumber products which conform to a procedure referenced in the ALSC Glued Lumber Policy. Conversely, such agencies shall not authorize the use of their ALSC recognized logo on glued lumber products manufactured to procedures other than those referenced in the ALSC Glued Lumber Policy.

## 10 References

**10.1 American Institute of Timber Construction (PLIB/AITC)**, 1010 South 336<sup>th</sup> Street #210 Federal Way, WA 98003.

**10.1.1 T107** Shear Test

**10.1.2 T119** Full Size End Joint Tension Test.

**10.2 American Lumber Standard Committee,**

**10.2.1** Lumber Enforcement Regulations ([www.alsc.org](http://www.alsc.org))

**10.2.2** ALSC Staff Responses ratified by the American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org))

**10.2.3** List of Approved Heat Resistant Adhesives ([www.alsc.org](http://www.alsc.org))

**10.2.4** ALSC Machine Graded Luber Policy ([www.alsc.org](http://www.alsc.org))

**10.3 American Wood Council (AWC),**

**10.3.1** National Design Specification for Wood Construction

**10.3.2** National Design Specification for Wood Construction Supplement, Design Values for Wood Construction.

**10.4 ANSI 405** Standard for Adhesives for Use in Structural Glued Laminated Timber.

**10.5 ASTM International**, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959

**10.5.1 D245-22** Standard Practice for Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber.

**10.5.2 D905-14** Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading.

**10.5.3 D1990-19** Standard Practice for Establishing Allowable Properties for Visually-Graded Dimension Lumber from In-Grade tests of Full-Size Specimens

**10.5.4 D2915-17(2022)** Standard Practice for Sampling and data-Analysis for Structural Wood and Wood-based Products.

**10.5.5 D2559-12a(2018)** Standard Specification for Adhesives for Structural Wood Products for Exterior Exposure.

**10.5.6 D4317-16(2023)** Standard Specification for Polyvinyl Acetate-Based Emulsion Adhesives.

**10.5.7 D4688/D4688M-14(2021)e1** Standard Test Method for Evaluating Structural Adhesives for Finger Jointing Lumber

**10.5.8 D4761-19** Standard Test Methods for Mechanical Properties of Lumber and Wood-based Materials.

**10.5.9 D5266-13(2020)** Standard Practice for Estimating Percentage of Wood in Adhesive Bonded Joints.

**10.5.10 D5572-95(2019)** Standard Specification for Adhesives Used for Finger Joints in Nonstructural Lumber Products.

**10.5.11 D6570-18a(2023)e1** Standard Practice for Assigning Allowable Properties for Mechanically Graded Lumber

**10.5.12 D7374-21** Standard Practice for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber.

**10.5.13 D7470-21** Standard Practices for Evaluating Elevated Temperature Performance of Adhesives Used in End-Jointed Lumber.

**10.5.14 E119-24** Standard Test Methods for Fire Tests of Building Construction and Materials.

**10.6 Canadian Standard Association** CSA Group 178 Rexdale Boulevard, Toronto, ON M9W 1R3 Canada

**10.6.1 CSA O112.7** (withdrawn) Resorcinol and Phenol-Resorcinol resin Adhesives for Wood (Room- and Intermediate-Temperature Curing)

**10.6.2 CSA O112.9:21** Evaluation of Adhesives for Structural Wood Products (exterior exposure)

**10.7 Kent, S. M. and Leichti R. J.** 2005. An assessment of common test methods to evaluate the mechanical properties of structural end-jointed lumber. Forest Products Journal Vo. 55, No. 3. Pg. 32-39.

Appendix A  
 Failure Modes Based on ASTM D4688

Mode	Description	Example
1	Failure mostly along the bondline surfaces of the joint profile with poor wood failure of any kind (wood failure < 70%)	
2	Failure mostly along the bondline surfaces of the joint profile with good wood shear failure (wood failure > 70%)	
3	Failure mostly along the joint profile but with some failure at the finger roots or scarf tips. Good overall wood shear failure along the joint profile surfaces.	
4	Mostly tensile wood failure at the fingerjoint roots or scarf tips and with high overall wood failure. Little failure of any kind along the joint profile.	
5	Failure beginning at the joint (possibly due to a stress riser) and progressing away from the joint. Essentially 100% wood failure.	
6	Failure away from the joint (not influenced by the joint) – all wood failure.	



Appendix B.  
Three Examples of Cross-Sections Ripped from Glued Billets Falling within the Scope of  
ALSC Glued Lumber Policy and Requiring Full-size Edgewise Bending Testing.

