



American Institute of Timber Construction

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AITC 407-2005

STANDARD FOR ALTERNATE LUMBER GRADES FOR USE IN STRUCTURAL GLUED LAMINATED TIMBER

Adopted as Recommendations, October 28, 2005

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407.1. SCOPE

This standard describes the requirements for alternate lumber grades to be used as substitutes for established grades of lumber in structural glued laminated timber. All alternate lumber grades meeting the requirements of this standard shall be qualified by test prior to use.

Lumber grades qualified under this standard are permitted to be used for all applicable structural glued laminated timber combinations provided that the average long-span E tension strength, and shear strength requirements of the grades of lumber for which they are being substituted are met, and the compression perpendicular to grain design values are satisfied.

This standard is not intended as a primary means of approval for new species intended to be used in structural glued laminated timber. The applicability of this standard to new species shall not occur prior to new species approval per ANSI/AITC A190.1.

407.2. GRADING

407.2.1. General. The dimensional tolerances, moisture content, and surfacing requirements for the lumber shall be in accordance with ANSI/AITC A190.1.

407.2.2. Lumber shall be graded according to the requirements of ANSI/AITC A190.1. All criteria used to sort lumber by grade prior to qualification testing shall be recorded to assure reproducibility in daily production.

407.3. QUALIFICATION TESTING

407.3.1. General. Qualification tests shall be performed on each width intended for use, except that qualification at a particular width will satisfy the requirements of the next smaller width provided that selection criteria for both widths are identical.

407.3.2. Tensile Strength. Alternate lumber grades substituting for 302 grades shall be qualified for tensile strength by testing in accordance with AITC Test T123 using a sample of 102 or more pieces

selected at random from production. To substitute for other grades, a minimum sample of 53 pieces shall be required.

The five percent tolerance limit with 75% confidence determined by this test shall equal or exceed the corresponding value for the grade shown in Table 1. For 8", 10" and 12" wide laminations of Southern Pine, the tabulated values are permitted to be multiplied by 0.98, 0.95, and 0.93, respectively. For 8", 10", and 12" wide laminations of all other species, the tabulated values are permitted to be multiplied by 0.95, 0.90, and 0.84, respectively.

To substitute for grades that are not tabulated, the appropriate strength levels shall be determined as follows:

For standard laminating grades, the five percent tolerance limit with 75% confidence determined from the test shall equal or exceed 2.1 times the minimum tensile strength determined from ASTM D3737 as follow: the tensile stress index shall be multiplied by the lesser of (1) the minimum strength ratio for knots or (2) the tensile stress modification factor for slope of grain.

For special tension laminations, the required 5% tolerance limit with 75% confidence shall be determined by multiplying the ASTM D3737 bending stress index by 1.15 for 302-24 grade, 1.05 for 302-22 grade, or 0.95 for 302-20 grade.

407.3.3. Modulus of Elasticity. Alternate lumber grades shall be qualified for long-span modulus of elasticity (E) by testing in accordance with AITC Test T116 using a sample of 53 or more pieces selected at random from production. The upper bound of the 95% confidence interval of the sample mean long-span E shall equal or exceed the value for the grade shown in Table 1. For grades that are not tabulated, the upper bound of the 95% confidence interval of the sample mean long-span E shall equal or exceed the long span E for the grade as determined by the procedures of ASTM D3737.

Table 1. Qualification Levels for Laminating Grades

Grade	Tension Strength 5% TL (psi)	E (10 ⁶ psi)
302-26 DF	4340	2.1
302-24 DF	4010	2.1
302-22 DF	3670	2.1
302-20 DF	3340	2.1
L1 DF	2420 ¹	2.1
L2D DF	1930 ¹	2.0
L2 DF	1680 ¹	1.7
L3 DF	1010 ¹	1.6
302-30 SP	5010	2.3
302-28 SP	4680	2.3
302-26 SP	4340	2.0
302-24 SP	4010	2.0
302-22 SP	3670	2.0
302-20 SP	3340	1.9
N1D SP	2000 ²	2.0

N1 SP	1890 ²	1.8
N2D SP	1630 ²	1.8
N2 SP	1520 ²	1.5
N3 SP	890 ²	1.4
302-24 HF	4010	1.8
302-22 HF	3670	1.8
302-20 HF	3340	1.7
L1D HF	2320	1.8
L1 HF	1980	1.7
L2 HF	1580	1.5
L3 HF	870	1.3

¹ Values obtained by tests reported by Evans and Marx, 1988. (Forest Products Journal 38(7/8):6-14).

² 2x6 tension values from 2002 SPIB Standard Grading Rules for Southern Pine Lumber multiplied by 2.1.

407.3.4. Shear Strength. Shear strength of the lumber shall be as established in accordance with ASTM Standard D3737.

407.3.5. Compression Perpendicular to Grain. The design value for compression perpendicular to grain for the lumber shall be as established in accordance with ASTM Standard D3737.

407.3.6. End Joints. Plants shall qualify end joints using lumber representative of production following the procedures in AITC Test T119. Qualification stress levels (QSL) shall be as required by ANSI/AITC A190.1.

407.4. QUALITY CONTROL

For alternate lumber grades qualified under this standard, quality control procedures shall be implemented and maintained at the laminating plant in accordance with ANSI/AITC A190.1. Quality control procedures shall be approved by an accredited inspection and testing agency and documented in the plant quality control manual.